



Agenda Item 4: Assessment of operational requirements to determine the implementation of improvements in communication, navigation and surveillance (CNS) capabilities for operations in route and terminal area

FOLLOW-UP TO REDDIG II PERFORMANCE

(Presented by the Secretariat)

SUMMARY	
This working paper shows the performance of the REDDIG II regional digital network since the SAMIG/16 meeting to date, and the activities to be conducted on the REDDIG II throughout the rest of 2016.	
References:	
<ul style="list-style-type: none">• Sixteenth workshop/meeting of the SAM Implementation Group (SAM/IG/16) Regional Project RLA/06/901 (Lima, Peru, 19-23 October 2015).• Nineteenth meeting of Project RLA/03/901 Coordination Committee, REDDIG Management and Satellite Segment Administration System (Lima, Peru, 7-9 March 2016).	
ICAO strategic objectives:	<i>A – Safety</i> <i>B – Air navigation capacity and efficiency</i>

1. Introduction

1.1 REDDIG II availability in 2015 dropped with respect to previous years, mainly due to problems during its initial commissioning. Availability was 99.9775 in 2015 and 99.9901 in 2014.

1.2 This section of the analysis addresses the following aspects of REDDIG II:

- REDDIG II performance
- Activities carried out since SAM/IG/16
Implementation of the REDDIG II node in Brasilia
REDDIG II training courses
- Holding of the Fifth REDDIG II technical operational meeting
- Analysis of the implementation of new REDDIG II services
LEVEL 3 ground network services
New REDDIG II services

*Implementation of a new REDDIG node in Córdoba
Relocation of the REDDIG node of Bogota*

- REDDIG II security analysis
- Follow-up of implementation tests conducted by the ANSPs of Chile to access the SITA ACARS service through the REDDIG II network

2 Discussion

Performance of REDDIG II

2.1 REDDIG II had some initial operational problems in some services such as AFTN, AMHS, some ATS speech and administrative circuits, the IP telephony network for the ATFM service, the management service (NMS), and the freezing of some satellite modems, which were resolved over time. At present, performance is stable and availability is high. The network still has some problems, such as random freezing in some satellite modems (Skywan).

2.2 It is 90% probable that the freezing of satellite modems is due to synchronisation failures between the RX RF part and the satellite modems (Skywan), according to a study conducted by NDSatCom, manufacturer of the satellite modem.

2.3 NDSatCom reported that, in order to solve this issue, all of the existing LNBS (which currently generate their own 10-MHz intermediate frequency internally) would need to be replaced by new LNBS (that would receive the 10-MHz intermediate frequency externally from the satellite modem).

2.4 In this regard, the LNBS of Manaus and Recife have been replaced so far. It is expected that the first phase will be completed in May 2016 with the replacement of the LNBS of Ezeiza and Lima. In this first phase, INEO will also proceed to replace the LNBS of the REDDIG II nodes of Guayaquil and Cayenne.

2.5 Once the LNBS in the six aforementioned nodes have been replaced, NDSatCom will conduct a new analysis of the system to check if there has been a significant reduction of TDMA CRC errors that would be causing the freezing of the satellite modems.

2.6 If a significant reduction of TDMA CRC errors is observed, the same modifications will be made to the hardware of all the remaining REDDIG II nodes. Otherwise, NDSatcom will have to conduct a more in-depth study in order to solve the satellite modem freezing problem.

2.7 The replacement of the LNBS in all REDDIG II nodes should be completed by mid 2016, in view of delays in customs clearance of the equipment in some of the States.

2.8 The final acceptance of REDDIG II will take place once the solution (LNB replacement) has been fully implemented and if no more freezing of the satellite modems occurs for a period of one month, and TDMA CRC errors are significantly reduced.

Activities conducted since the SAM/IG/16 meeting

2.9 In addition to solving the pending aspects, the following activities were conducted since the SAM/IG/16 meeting:

- Implementation of the REDDIG II node in Brasilia
- REDDIG II training course

Implementation of the REDDIG II node in Brasilia

2.10 Like all REDDIG II nodes, the new node of Brasilia consists of four parts, with two redundant channels to ensure high network availability. The first part is the outdoor equipment, consisting of one new 3.8m-diameter antenna, the elements of the LNB receiver, and the SSPA for transmission (40-Watt amplifier). The second part is the most important part of the node, and includes the CISCO 2901 routers, acting as interface with the services, and the satellite modems (SKYWAN 1070) for transmitting and receiving satellite information. The other two parts are the monitoring system and the VPN router for external connection.

2.11 The equipment to access the LEVEL 3 fibre optics ground network consists of two 2901 routers that are activated in case of failure of the satellite network. As in the other REDIG nodes, the bandwidth to access the ground network is 256Kbits/sec.

2.12 Services at the Brasilia node consist of an AFTN circuit with Guyana and 11 AMHS circuits (all States adjacent to Brazil and the circuit with Atlanta through the MEVA III REDDIG II interconnection). Regarding speech circuits, there are three administrative switched circuits and four ATS switched speech circuits.

2.13 Installation of the new REDDIG node in Brasilia started in December 2015, the satellite sub-network started operating in January 2016, and the ground sub-network (LEVEL 3 MPLS network) became operational in mid April 2016. At the moment, Brasilia node is operating and integrated with all REDDIG II nodes.

REDDIG II training courses

2.14 As part of the 2015-2016 training plan for REDDIG II maintenance personnel approved by the Eighteenth REDDIG Coordination Meeting (RCC/18) held in Lima, Peru, on 2-4 March 2015 and the Nineteenth REDDIG Coordination Meeting (RCC/19) held in Lima, Peru, on 1-3 March 2016, two basic courses on CISCO IP switches and routers were held in Lima, Peru, on 9-13 November 2015 and 4-8 April 2016.

2.15 During the first course, entitled “*Interconnecting Cisco Network Devices Part 1 (ICND1)*”, the participants received information on Internet connectivity, management of network security devices, implementation of a medium-capacity network, and introduction to IPv6. The main content of the second course, entitled “*Interconnecting Cisco Network Devices Part 2 (ICND2)*” was as follows: implementation of medium-capacity scalable networks, implementation of the EIGRP solution, implementation of an OSPF-based multi-area scalable network, and management of network devices.

2.16 REDDIG II operation and management courses for technical personnel REDDIG II member States that did not attend the REDDIG II operation and maintenance courses held in 2015 will be held one in Spanish on 5-9 September 2016 in Buenos Aires, Argentina, and the other one in English on 26-30 September 2016, tentatively in Georgetown, Guyana.

2.17 The REDDIG II operation and maintenance course includes a general description of the REDDIG II, REDDIG II nodes, RF equipment, the Skywan modem, the Ethernet switch, the CISCO router, the baseband switch, and the NMS.

2.18 The RCC/19 meeting requested the Secretariat to find out about courses on the operation, maintenance and programming of SKYWAN satellite modems, as well as costs for a group of 20 persons or a smaller group of 2 or 3 who would then replicate the training to a larger number of people in charge of REDDIG II maintenance. Initial information is shown in the **Appendix** to this working paper.

Fifth REDDIG II technical operational meeting

2.19 The RCC/19 meeting agreed to conduct the Fifth REDDIG technical operational meeting on the week of 18 July 2016 in Manaus, Brazil.

Analysis of the implementation of new REDDIG II services

LEVEL 3 ground network services

2.20 The 54-month lease of LEVEL 3 ground network services started on 1 January 2016 between ICAO, on behalf of all REDDIG member States and LEVEL 3 PERU. The contract will be renewed on an annual basis, and ICAO is analysing whether payment for LEVEL 3 services will be made on a monthly, quarterly or semi-annual basis.

2.21 The meeting considered that REDDIG member States should review the Service Level Agreement (SLA) contained in Appendix XI to the REDDIG II contract. In this regard, no comments were received, so the Secretariat deemed approved the SLA presented by LEVEL 3.

New REDDIG II services

2.22 New AMHS circuits are scheduled for implementation in 2016. The circuits to be implemented and their estimated date of implementation are shown in WP/08 of this Meeting. The AMHS circuit between Brazil and Peru became operational in early 2016. Colombia reported that AMHS installation might be delayed due to the relocation of the new control centre.

Implementation of a new REDDIG node in Córdoba

2.23 Argentina informed the RCC/19 meeting that, due to the construction of a new control centre in Ezeiza, a new REDDIG II node would need to be installed, and the existing node in Ezeiza would need to be relocated in the Córdoba airport. In this regard, the Secretariat was charged with requesting INEO to submit an economic proposal. The installation of the new node and the relocation of the existing node to Córdoba would take place in 2017.

Relocation of the REDDIG node of Bogotá

2.24 The relocation of the existing node of Bogotá to the new Bogotá ACC facilities is foreseen for mid-2016. ICAO, INEO, the telecommunication service provider, and the Special Civil Aviation Unit (*Unidad Especial de Aviación Civil*) took initial actions.

REDDIG II security analysis

2.25 The RCC/19 meeting deemed it important to conduct an analysis of REDDIG II security in order to protect it from any external interference, and to define a common solution applicable to all REDDIG nodes. In this regard, an *ad hoc* group was established, made up by Argentina, Brazil, Colombia, French Guiana (France), Paraguay, Peru, and the Secretariat.

2.26 The members of the *ad hoc* group held a teleconference on 26 April 2016, whose initial results are presented in a working paper prepared by Argentina for this Meeting.

Follow-up to the implementation tests conducted by the ANSPs of Chile to access the SITA ACARS service through the REDDIG II network

2.27 As a follow-up to Conclusion RCC/18-2 *Tests to access the SITA data link service through the REDDIG II by ANSPs*, the RCC/19 meeting considered that the tests to access the data link information of the Oceánico ACC of Chile through the REDDIG II up to the REDDIG II Recife node and then through the SITA network up to the new processing centre in Rio had been successful.

2.28 The RCC/19 meeting felt that, although the results of the tests had been positive, these should continue until the first week of May 2016 to further analyse the performance of the REDDIG data link service. The results of these extended tests would be initially presented at a teleconference to be held the first week of May 2016 with the participation of all REDDIG II and SITA member States.

2.29 The RCC/19 meeting was presented with a network configuration design developed by SITA for operational use by any ANSP willing to connect to SITA using its REDDIG II node as point of access, thus ensuring a profitable use of an ATC dedicated network.

2.30 The RCC/19 meeting considered that in order to review the network configuration in detail, REDDIG II members would need to know the final results of the tests conducted in Chile, as well as the cost-benefit study conducted by Chile and SITA using the REDDIG II to carry the data link service. In this sense, the SITA representative noted that the results would be presented at the SAM/IG/17 meeting to be held in Lima, Peru, on 9-13 May 2016.

3 Suggested action

3.1 The Meeting is invited to:

- a) take note of the information presented in this paper;
- b) follow up on REDDIG II performance assessment activities; and
- c) discuss any other related matters as the Meeting may deem appropriate.


APPENDIX

ND SATCOM

SKYWAN 7000/1070 SATELLITE NETWORKS (VSAT) COURSE

IND SATCOM

SKYWAN IDU 7000/1070 COURSE OVERVIEW



Premium Satellite Communications
Systems & Solutions

Version: August 2015

ND SATCOM

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1 COURSE OVERVIEW: SKYWAN 7000/1070 SATELLITE NETWORKS (VSAT)

ND SatCom offers training in various areas such as installations, operations, maintenance and management of our products and solutions. Convenient **classroom & hands-on training** is available all year-round at our training center in Friedrichshafen. We also offer trainings on request at our regional branches or at customer premises.

ND SatCom training is the most efficient way to get a full comprehension of ND SatCom products and solutions.



The following training course catalogue is based on the current SKYWAN generation with IDU 7000 series and IDU 1070 series. Detailed descriptions of well-proven predefined courses about SKYWAN are available for review.



Beside the SKYWAN predefined courses various customized training packages are possible. Such courses will be defined according to customer specific needs and requirements. The flexible content can be a selection of existing course modules enriched by additional customer topics. For the arrangement of a customized package please contact our training experts. The professional training courses covering all relevant topics for SKYWAN satellite networks.

ND SATCOM

Our hands-on training enables you to quickly install your VSAT stations, discover how to commissioning and operate your network and learn through ongoing monitoring and maintenance how network downtime can be minimized.

The following figure illustrates the standard course overview for SKYWAN satellite networks:

Tasks	Network Designer	Network Operator	Station Commissioner
Entry	Satellite communication fundamentals (VSAT) Course 8000 / 2 days		
			Installation basics (VSAT station) Entry level Course 8010 / 1 day
Basic / Specialist	Network design & engineering Basic level Course 8340 / 3 days	Network commissioning & operation Basic level Course 8240 / 5 days	Station commissioning Basic level Course 8140 / 1 day
Advanced / Expert	Network design & engineering Advanced level Course 8350 / 2 days	Network commissioning & operation Advanced level Course 8250 / 4 days	Station commissioning, installation & maintenance Advanced level Course 8150 / 2 days
Optional		Configuration of SKYWAN FAD Basic level Course 8243 / 2 days	
	Expert Certification Network Designer 1 day	Expert Certification Network Operator 1 day	Expert Certification Station Commissioner 1 day

The following course descriptions will provide the necessary detailed information about available course modules.

1.1 Station Commissioning (8140)

Title	8140 - SKYWAN IDU 7000/1070 Station Commissioning
Level	Basic / Specialist
Objectives	<p>The participant will be able to: Prepare & commission a SKYWAN station to become a member of a SKYWAN network and perform tests at station level, i.e.:</p> <ul style="list-style-type: none"> • Install a SKYWAN indoor unit, • Setup a SKYWAN IDU with a predefined parameter set, • Run station specific functional tests, • Control relevant parameters for proper station operation.
Contents	<p>Description of SKYWAN solution:</p> <ul style="list-style-type: none"> • SKYWAN features, hardware & interfaces, • Configuration file & software images, • Interfacing of outdoor unit (RFT, LNB, cabling), • SKYWAN station setup wizard. <p>Installation check of outdoor equipment (ODU):</p> <ul style="list-style-type: none"> • Visual checks, • Check of antenna pointing. <p>Installation steps & Line-up procedure:</p> <ul style="list-style-type: none"> • Loading a predefined configuration, • Change essential configuration parameters, • Required information for proper Line-up, • Procedures (perform tests, final adjustments, cross-pol & power settings). <p>Initial station operation:</p> <ul style="list-style-type: none"> • Basic monitoring (i.e. via LuM and LED indications), • Essential adjustments, • General pitfalls, • Troubleshooting procedure (Identify & localize general failures).
Target Group	Station commissioner (installation staff)
Duration	1 day
Prerequisites	<p>The following prerequisites are mandatory for the participant:</p> <ul style="list-style-type: none"> • Good knowledge in 'satellite communication fundamentals (VSAT)', • Good knowledge in 'installation basics (VSAT)' (e.g. like course 8010) • General good English language skills.
Environment	SKYWAN IDU 7000/1070 hardware, PC or notebook with SKYWAN Line-up Manager software (LuM), antenna system with RFT & LNB.
Methods	Lecture, hands-on (partly outside classroom), demonstrations, practical exercises.

1.2 Advanced Station Commissioning, Installation & Maintenance (8150)

Title	8150 – SKYWAN IDU 7000/1070 Station Commissioning, Installation & Maintenance
Level	Advanced / Expert
Objectives	<p>The participant will be able to: Commission a SKYWAN station to become a member of a SKYWAN network and perform tests at station level, i.e.:</p> <ul style="list-style-type: none"> • Install a SKYWAN indoor unit, • Setup a SKYWAN IDU with a predefined parameter set, • Run station specific functional tests, • Control relevant parameters for proper station operation, • Perform basic maintenance tasks. <p>This course is the mandatory prerequisite for the participation in the additional certification course ‘Expert SKYWAN IDU 7000/1070 Station Commissioner’.</p>
Contents	<p>Work on various installation example cases:</p> <ul style="list-style-type: none"> • Focus on frequent pitfalls and most critical installation steps. <p>Station commissioning and operation:</p> <ul style="list-style-type: none"> • Run standard site acceptance test (SAT) procedure, • Run advanced trouble shooting procedures, • Interaction with the SKYWAN Network Operator. • Advanced monitoring. <p>Station maintenance:</p> <ul style="list-style-type: none"> • Perform basic / preventive maintenance tasks, • Failure localization, • Exchange of station components (IDU, IDU-boards, LNB, RFT).
Target Group	Station commissioner (installation staff)
Duration	2 days(if certification is required 1 additional day for certification)
Prerequisites	<p>The following prerequisites are mandatory for the participant:</p> <ul style="list-style-type: none"> • ND SatCom course 8140, • General good English language skills.
Environment	SKYWAN IDU 7000/1070 hardware, PC or notebook, antenna system with RFT & LNB.
Methods	Lecture, hands-on (partly outside classroom), demonstrations, practical exercises.

1.3 Network Commissioning & Operation (8240)

Title	8240 - SKYWAN IDU 7000/1070 Network Commissioning & Operation
Level	Basic / Specialist
Objectives	<p>The participant will be able to: Plan and configure an entire SKYWAN network ready for network operation based on a predefined design, i.e.:</p> <ul style="list-style-type: none"> • Set initial network & station parameter configuration, • Configure network management relevant parameters, • Monitor & control relevant parameters for proper network operation, • Maintain the required grade of service within the network.
Contents	<p>Description of SKYWAN solution:</p> <ul style="list-style-type: none"> • SKYWAN IDU features, • SKYWAN NMS features. <p>SKYWAN NMS installation: Initial parameter configuration:</p> <ul style="list-style-type: none"> • Network Configurator (Configuration groups & profiles concept; network planning, profile activation & configuration upload), • Satellite link (Configuration of station; network & master/ backup-master), • Network management parameter (Access control for node- & network management). <p>Monitor & control relevant parameters:</p> <ul style="list-style-type: none"> • Monitoring TDMA parameters (LED indications; essential parameters; monitoring screens), • Reconfiguration cases (Fully meshed to star; new frequencies; add 2nd demodulator), • Basic Pitfalls & Troubleshooting. <p>Configure user traffic:</p> <ul style="list-style-type: none"> • IP-feature overview (OSPF, RoHC, load-balancing, IP multicast, TCP-A) and IP-router configuration, • FR-feature overview and basic port configuration. <p>SKYWAN NMS network tasks:</p> <ul style="list-style-type: none"> • Network adjustments, • MIB statistics, • Useful graphs, • Network trouble-shooting procedures.
Target Group	Network Operator
Duration	5 days
Prerequisites	<p>The following prerequisites are mandatory for the participant:</p> <ul style="list-style-type: none"> • Good knowledge in TCP/IP basics, • Good knowledge in 'satellite communication fundamentals (VSAT)', • General good English language skills.
Environment	SKYWAN IDU 7000/1070 hardware, PC or notebook with SKYWAN NMS software, inter-cabling of some SKYWAN stations for a small network.
Methods	Lecture, hands-on with NMS tools, demonstrations, practical exercises.

1.4 Advanced Network Commissioning & Operation (8250)

Title	8250 - SKYWAN IDU 7000/1070 Network Commissioning & Operation
Level	Advanced / Expert
Objectives	<p>The participant will be able to: Plan and configure an entire SKYWAN network ready for network operation based on a predefined design, i.e.:</p> <ul style="list-style-type: none"> • Set initial network & station parameter configuration, • Configure network management relevant parameters, • Monitor & control relevant parameters for proper network operation, • Maintain the required grade of service within the network, • Perform necessary FAT- and NAT-procedures. <p>This course is the mandatory prerequisite for the participation in the additional certification course 'Expert SKYWAN IDU 7000/1070 Network Operator'.</p>
Contents	<p>Parameter configuration for certain use cases:</p> <ul style="list-style-type: none"> • Network Configurator (Configuration groups & profiles concept; network planning, profile activation & configuration upload), • Satellite link (Configuration of station; network & master/ backup-master), • Network management parameter (Access control for node- & network management). <p>Acceptance tests:</p> <ul style="list-style-type: none"> • Run FAT procedure, • Run NAT procedure, • Troubleshooting approach. <p>Special configurations:</p> <ul style="list-style-type: none"> • Station & network redundancy, • Basic configuration of serial interfaces (i.e. for standard user FR-traffic). <p>Configure & optimize user IP-traffic:</p> <ul style="list-style-type: none"> • Quality-of-Service features for IP-traffic, • Advanced router configuration. <p>SKYWAN NMS advanced network tasks:</p> <ul style="list-style-type: none"> • Advanced network adjustments, • Additional useful graphs.
Target Group	Network Operator
Duration	4 days
Prerequisites	<p>The following prerequisites are mandatory for the participant:</p> <ul style="list-style-type: none"> • ND SatCom course 8240, • Good knowledge in TCP/IP basics, • General good English language skills.
Environment	SKYWAN IDU 7000/1070 hardware, PC or notebook with SKYWAN NMS software, inter-cabling of some SKYWAN stations for a small network.
Methods	Lecture, hands-on with NMS tools, demonstrations, practical exercises.

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1.5 Network Design & Engineering (8340)

Title	8340 - SKYWAN IDU 7000/1070 Network Design & Engineering
Level	Basic / Specialist
Objectives	The participant will have general knowledge about: <ul style="list-style-type: none"> • Designing & engineering SKYWAN satellite networks, • Usage of the SKYWAN IDU 7000/1070 TDMA calculation tool.
Contents	<p>Description of SKYWAN solution & features:</p> <p>General carrier design:</p> <ul style="list-style-type: none"> • Traffic calculation (Networking features overview; calculation tool & procedure), • Carrier design (Essential satellite link layer features: Master/ Slave concept, channel coding & modulation, topologies and populations, reference burst modes, data transport; TDMA parameter optimization tool & procedure). <p>Outdoor unit design (incl. satellite selection):</p> <ul style="list-style-type: none"> • Essential satellite link features, • Choice of satellite / transponder, • Outdoor unit design process, • SKYWAN link budget tool & procedure. <p>Detailed indoor unit design:</p> <ul style="list-style-type: none"> • Detailed SKYWAN IDU data, • IP features: IP router, static routing, dynamic routing (OSPF), differentiated services, robust header compression (ROHC), TCP-Acceleration, IP multicast, load balancing, • FR features: port types, basic FR service, traffic shaping, congestion management, communication services, FR multicast), <p>Design finalization & cost optimization:</p> <ul style="list-style-type: none"> • Optimization of network design, • Operational costs versus hardware costs.
Target Group	Network Designer
Duration	3 days
Prerequisites	The following prerequisites are mandatory for the participant: <ul style="list-style-type: none"> • Good knowledge in 'satellite communication fundamentals (VSAT)', • General good English language skills.
Environment	PC or notebook with SKYWAN IDU 7000/1070 TDMA calculation tool and MS Excel and SKYWAN link budget tool.
Methods	Lecture, demonstrations & exercises, hands-on tool training.

1.6 Advanced Network Design & Engineering (8350)

Title	8350 - SKYWAN IDU 7000/1070 Network Design & Engineering
Level	Advanced / Expert
Objectives	<p>The participant will have good knowledge about:</p> <ul style="list-style-type: none"> • Designing & engineering SKYWAN satellite networks, • Usage of the SKYWAN IDU 7000/1070 TDMA calculation tool. <p>This course is the mandatory prerequisite for the participation in the additional certification course 'Expert SKYWAN IDU 7000/1070 Network Designer'.</p>
Contents	<p>Work on various engineering example cases:</p> <p>Carrier & outdoor unit design:</p> <ul style="list-style-type: none"> • Focus on frequent pitfalls and most critical design steps. • Approaches for design optimization, • Usage of DDD template & result documentation, • Interfacing with 'Network Commissioning'. <p>Advanced traffic analysis and QoS-requirements.</p>
Target Group	Network Designer
Duration	3 days
Prerequisites	<p>The following prerequisites are mandatory for the participant:</p> <ul style="list-style-type: none"> • Participation in ND SatCom course 8340, • General good English language skills.
Environment	PC or notebook with SKYWAN IDU 7000/1070 TDMA calculation tool and MS Excel and SKYWAN link budget tool.
Methods	Lecture, advanced exercises, hands-on tool training.

2 OPTIONAL COURSE MODULES

For certain solutions e.g. with FAD voice multiplexers or flyaway antennas, dedicated / optional courses are available. Some examples you will find on the pages below:

2.1 Configuration of SKYWAN FAD (8243)

8243 – Configuration of SKYWAN FAD	
Title	8243 – Configuration of SKYWAN FAD
Level	Basic / Specialist
Objectives	<p>The participant will be able to: Configure a SKYWAN FAD for basic operation within the SKYWAN network, i.e.:</p> <ul style="list-style-type: none"> • Install a SKYWAN FAD unit, • Setup a SKYWAN FAD with a predefined parameter set, • Run specific functional tests of the unit and within a SKYWAN network.
Contents	<p>Description of SKYWAN FAD solution:</p> <ul style="list-style-type: none"> • Overview about FAD Series 9220 / 9230, • SKYWAN FAD features, • Hardware (interfaces, boards, functionalities, DSP SIMM), • WAN connection & PVC/R protocol, • Supported data protocols & voice codecs, • Configuration file & software images, • Interfacing with SKYWAN IDU. <p>Operator access & command line interface.</p> <p>Configuration section & relevant parameters.</p> <p>Basic pitfalls, test procedures and troubleshooting.</p>
Target Group	Network Operator or Application Configurator FAD
Duration	2 days
Prerequisites	<p>The following prerequisites are mandatory for the participant:</p> <ul style="list-style-type: none"> • Participation in ND SatCom course 8240, • Good knowledge in TCP/IP basics, • Good knowledge in 'satellite communication fundamentals (VSAT)', • General good English language skills.
Environment	SKYWAN IDU 7000 series hardware, SKYWAN FAD hardware, PC or notebook with SKYWAN NMS software, inter-cabling of some SKYWAN stations (with FAD) for a small network.
Methods	Lecture, demonstrations, practical hand-on exercises.

2.2 Installation basics (8010)

Title	8010 – Installation Basics (VSAT Station)
Level	Entry / Beginners
Objectives	The participant will be able to: <ul style="list-style-type: none"> • perform the proper installation of a VSAT station, • do the antenna pointing, • use the necessary equipment & tools.
Contents	The following topics are included: <ul style="list-style-type: none"> • Antenna assembling & mounting, • Grounding & lightning protection, • Cabling & soldering (optional), • Mounting of ODU equipment, • Antenna pointing.
Target Group	Especially for persons new with installation tasks, who want to participate in the product specific courses (i.e. ND SatCom course for “station commissioning”).
Duration	1 day
Prerequisites	The following prerequisites are mandatory for the participant: <ul style="list-style-type: none"> • Basic knowledge in ‘satellite communication fundamentals (VSAT)’, • General good English language skills.
Environment	Spectrum analyzer, antenna system with RFT & LNB.
Methods	Lecture, hands-on (partly outside classroom), demonstrations, practical exercises.

2.3 Satellite communication fundamentals (8000)

Title	8000 Satellite Communication Fundamentals (VSAT)
Level	Entry / Beginners
Objectives	The participant will get good knowledge about satellite communication fundamentals and will get the prerequisite knowledge to continue with our product specific courses.
Contents	<p>The following topics are included:</p> <ul style="list-style-type: none"> • History & benefits of satellite communication, • The satellite & the satellite link, • Units & definitions, • Multiplexing methods, • From voice to bits – digitization basics, • From bits to waves – modulation basics, • Basic VSAT ground station overview, • Antenna basics, • Transmit & receive components (demonstration waveguide), • Safety at work, • Spectrum analyzer basics, • Optional: Hands-on antenna pointing exercise.
Target Group	Anyone interested in satellite communication or persons new in satellite communication technology.
Duration	2 days
Prerequisites	<p>The following prerequisites are mandatory for the participant:</p> <ul style="list-style-type: none"> • General good English language skills.
Environment	Classroom
Methods	Lecture, discussion, demonstrations.

3 COURSE CERTIFICATE

The ND SatCom courses will provide a solid knowledge about the selected topic for the participant. The following knowledge levels within the available course sequence are introduced:

- Entry level (Beginners)
- Basic level (Silver - Specialist)
- Advanced level (Gold - Expert)

Customer will be able to go for:

- Participation in entry / basic / advanced level courses (without test),
- Participation in additional dedicated Expert certification courses.

ND SatCom provides currently the following standardized certification courses:

- Expert SKYWAN 7000 Network Designer,
- Expert SKYWAN 7000 Network Operator,
- Expert SKYWAN 7000 Station Commissioner.

By passing our certification courses a common and exchangeable base of proven knowledge and skills will be guaranteed.

All Expert certificates are valid for **2 years**. Prolongation requires a dedicated and timely re-certification.