Questions and Answers from the first LDACS webinar. Most recent question on top.

Nr	Question	Answer
#1	What would be the business model for LDACS in between ANSP and current ARINC, SITA, ... providers	Philippe Sacre We will address this in Webinar 3, as much as we can.
#2	Besides of Europe and the US points of view, do you know what is the position of other countries / regions with respect the adoption of LDACS?	Philippe Sacre ICAO is the forum for this. Beyond Europe, we see participation also now increasing from Asia and US industry. This campaign has a goal of increasing awareness worldwide too
#3	Can LDACS complement/replace GNSS for on-board performance alerting and monitoring, enabling (some) RNP operations without GNSS?	Philippe Sacre NAV aspects will be discussed in webinar 2
#4	What is the meaning of initial ICAO standards? Can they be implemented or is there a target date for final standards?	Philippe Sacre We are working on the Manual; SARPS are ready. Q3/2022 is current date for the ICAO documents to be complete, applicability 2024. This is the current timeline.
#5	Can we expect that LDACS V4 activities be performed under SESAR 3 program ?	Philippe Sacre TRL6 (V3) will be reached for LDACS A/G COM end 2022 when Wave 2 ends. SESAR 3 contents is not yet defined, I cannot answer that.
#6	In terms of NAV and SUR, I assume LDACS is envisioned to be one component as part of a multi-sensor concept for CNS, together with multi-GNSS/DFMCS, IRS and remaining conventional CNS networks? We need a resilient "system of systems".	“Yes, this is the view. There is a strategy document explaining this for SESAR solution 76. I can share this later." - That's great. Some have been waiting for this for years, as it has become evident that GNSS isn't enough for assured PNT.
#7	In terms of NAV and SUR, I assume LDACS is envisioned to be one component as part of a multi-sensor concept for CNS, together with multi-GNSS/DFMCS, IRS and remaining conventional CNS networks? We need a resilient "system of systems".	Philippe Sacre Yes, this is the view. There is a strategy document explaining this for SESAR solution 76. I can share this later. Ricardo De Sousa / NATS

		LDACS A-PNT will complement DME initially and aim to replace the need for DME in the future and so provide a higher performing terrestrial A-PNT option in the long run
#8	How would LDACS developed in Europe and US be compatible and acceptable for the rest of the world? Are these to be accepted and implemented worldwide?	Philippe Sacre ICAO is taking care of this. SARPS have been developed already, the Manual is under development. This is of worldwide interest. Vaughn Maiolla There is also a detailed LDACS Specification which has been developed under SESAR, which will be continually improved and updated as validation of LDACS Is performed.
#9	Bottleneck or single point of failure is still if we will try to use LDACS for COM, NAV, SUR, MET, ATS, AOC etc ... simultaneously. Also possible jamming of L-band (even aviation protected band) shall be taken into account.	Philippe Sacre Agreed! LDACS is envisioned as a COM system with backup capabilities for the other systems you mention; This 'integrated CNS' concept is being discussed in SESAR and other places including ICAO.
#10	Do you have any information on the position accuracy of the LDACS? Would it offer any improvements on the altitude measurement compared to non augmented GPS systems?	Philippe Sacre APNT capabilities will be discussed in webinar 2
#11	Concerning LDACS-COM, its an IP based tech, whereas EU only uses ATN OSI - how will the two terrestrial systems coexist? Separate RF networks with gateways. Will the airplanes be required to support both VDL2 ATN OSI and LDACS IP?	Philippe Sacre This is too technical for this intro: please wait for webinar 2 on June 2 Vaughn Maiolla Serious operational use of LDACS will begin once the EU States have migrated to the use of IPS. Aeronautical communication using the ATN/IPS as a backbone is the end-state in the current US and EU and indeed global plans. Accommodation via gatewats and other means will however be needed during the transition phase.
#12	If SATCOM gives me global wideband coverage, why would we invest money in any ground based system?	Michael Schnell Some reasons I could think of: expensive, larger delay, less received power (more interference susceptibility), large footprint with lots of a/c inside limits throughput per a/c, single point of failure (consider possibility of solar storms, collision of satellites -

		they get more and more and are low-accuracy mass-market products now) ... We see the need to have both SATCOM and ground-based broadband connectivity; see future COM infrastructure (Vaughn Maiolla) as this provides the necessary diversity and robustness needed. In addition the FCI studies demonstrated that the FCI should be based on multiple technologies.
#13	Can LDACS support OCEANIC comms?	Philippe Sacre Air-Air LDACS capabilities are being defined to increase the reach of pure 'line-of-sight'. This is research. Not available for now, LDACS will be introduced - if at all - for the same needs as VDL2. More technical details in W2.
#14	global SATCOM LDACS is foreseen or viable?	Philippe Sacre Implementation options are for W3.
#15	What is the target date for IOC?	Philippe Sacre TRL6 to be reached end 2022, SARPS applicable 2024. Target date in that time scale.
#16	Where is actually the 'bottleneck" in the given system and what are actually the barriers to growth efficiently and safely: communications, airspace/ATC separation rules, airports, what?	Philippe Sacre Challenges to growth are multiple, from airport capacity to environmental constraint. Radio Spectrum usage is one of them too, hence there is a need for an integrated CNS system, LDACS being an option for that.
#17	Are any results available on the coexistence study with DME?	Philippe Sacre ICAO NSP panel and ICAO PT-T have regular meetings about that Vaughn Maiolla This work in on-going however the results thus far have been positive. Ruben Flohr We will address that in the next webinar
#18	If LDACS shares frequency band with DMEs then sensitivity of DME (max range) will be changed and also probably all existing DME	Philippe Sacre We are testing and defining compatibility criteria with DME at this very moment

	TX / RX units will need additional some adjustments (especially if LDACS TX is nearby). [1090 MHz WAM vs DVB-T and LTE signals was similar case]	
#19	Could you share presentations please?	Philippe Sacre will be done on SJU page
#20	Will Voice-over-LDACS support group calls such that situational awareness of e.g. all approaching aircraft listen in on the frequency and building understanding of what others are doing? Or will CONOPS have to change?	Philippe Sacre We are looking at that FOR THE VERY MOMENT in the SESAR digital voice project Ruben Flohr Our current PJ33 is currently investing both options with full duplex all-broadcast channel, and full-duplex point-to-point. Acceptability of loss of party line is likely to be dependent on the environment (e.g., more acceptable in high en-route sectors than in TMA or airport), so it would be preferable to have a digital voice technical solution allowing all options, for the ANSP to choose depending on the operational environment.
#21	Global SAT LDACS is foreseen or viable?	Philippe Sacre Please clarify the question: global SATCOM + global LDACS for terrestrial?
#22	Is there any study about LDACS co-existence with Link 16 MIDS terminals?	Philippe Sacre Yes, compatibilty are cuurently being performed including testing
#23	Is the A-PNT features going to replace nav services like DME or VOR?	Philippe Sacre The strategy for this is being defined. A backup for GNSS is needed, the role of LDACS in this is under discussion, to be seen how it can be used with DMEs etc. But it is an important point;
#24	In the given airspace where 'everybody' is supposed to be connected with 'everybody', who is at the end responsible for maintaining safety (for example conflict resolution)?	Ruben Flohr The questions seems a bit too generic to answer in a straightforward way. The UTM/U-space/UAM airspace is segregated from airspace that is controlled by ATC. For RPAS that operate under IFR in controlled airspace the same principles as apply as for any other IFR traffic.

#25	In congested airspace/cell with many connected aircraft, we may require more than single channel in the cell. Can present frequency allocation of 60MHz support sufficient bandwidth in congested European airspace?	Ruben Flohr This will be addressed in the 2nd webinar
#26	Can LDACS scale to include also sUAS communications for BVLOS control signals for steeting drones, and also the payload (video) data? Or will drone use of LDACS be constrained to ATC related comms to avoid congestion?	Ruben Flohr The provision of C2 (command and control) for drones is currently outside the scope of LDACS. However, I could imagine that for RPAS operating under IFR in controlled airspace, the C2 becomes safety and time critical, and from a safety perspective, it may make more sense to use LDACS for those. Studies on this are still ongoing. I would not expect video down streaming to go over LDACS. Even though a prioritisation mechanism is built in, it is not a target application for LDACS.
#27	"A priori introducing LDACS itself does not require pilot training for 'using it'." is an engineering view on introducing new technology. Unless the application of the new technology completely replicates the task flow, there will be changes. Are analyses of these changes done or on the way?	Philippe Sacre Thanks for the view. I compare to AMHS for AFTN: introducing a technology does not necessarily change the operations; they will change much more when new applications are introduced that use the new technical capabilities; in any case we are collaborating with OPS experts for the use cases of FCI/LDACS/SATCOMS
#28	Is The LDACs will be replace completely the AM voice Com for A/G communication?	Philippe Sacre This LDACS Voice (digital) capability are being studied. The main goal now is for DATA comms, in parallel to the VHF voice (voice itself will never disappear that we know of)/
#29	With respect for security issues and specifically to cybersecurity, what are the drawbacks already present?	Ruben Flohr It's actually on the contrary: Compared to VLDM2, LDACS provides mechanisms for authentication, encryption and message prioritisation. All contributing to strengthening the CIA (confidentiality, integrity, availability) for datalink. On top, as A-PNT is makes the NAV capabilities (which are default GNSS) more resilient against jamming (which is much easier for GNSS than for LDACS due to the low signal to noise ratio).
#30	Will the presentations be shared?	Philippe Sacre YES on SJU site

#31	What is the business model envisioned and network governance?	Philippe Sacre Please expect this in webinar 3 :)
#32	Is it envisaged to transport voice over LDACS?	Philippe Sacre SESAR is studying this digital voice over LDACS in Wave 3 indeed. So in principle YES.
#33	Can LDACS in A-G and G-G carry also some A-CDM data sharing functions between all involved partners?	Philippe Sacre The use cases are numerous, this is possible one indeed but an airport datalink has been standardized: AeroMACS
#34	Does Eurocontrol foresee some kind of leading role for itself in the prospective deployment of LDACS?	Philippe Sacre Yes by supporting the stakeholders, together with the SDM partners (SESAR Deployment Manager)
#35	Can LDACS provide a backup position input for ADS-B/C, EGPWS, HTAWS, etc.?	Philippe Sacre The NAV capabilities of LDACS are a very important topic in 'APNT' (alternative positioning and timing). We can provide references to work on this.
#36	Will it be and for how much needed to modify training of both pilots and ATC controllers in order to modify their current mental models of operations? In particular what about maintaining their selective attention?	Philippe Sacre LDACS is a techno. The applications added to use this techno will require some training or not. A priori, introducing LDACS itself does not require pilot training for 'using it'.
#37	LDACS is today foreseeable only for G/G when will be G/A possible?	Philippe Sacre The main focus is A/G. Was that your question?
#38	What would be the estimated cost of retrofitting an a/c with LDACS?	Philippe Sacre we are looking at this in the FVI business case Vaughn Maiolla As mentioned in the presentations, implementation options which reduce the impact of this are being carefully considered, ie: multimode (VDL-m2/LDACS) avionics and antenna sharing.

#39	How accurate is the LDACS positioning capability? Can it support e.g. RNP approach procedures and help ensure safety and continuity in the event of a serious GNSS outage?	Ruben Flohr The accuracy off LDACS as A-PNT will be addressed in the 2nd webinar
#40	The added value to the sector capacity is not clear?	Ruben Flohr Constraining factors on sector capacity do not only come from the ATCO perspective. Also the communication technology, both in VHF and datalink, is reaching it's limits in supporting future growth of traffic. The shift to TBO (from tactical to pre-tactical separation management through the introduction of complex clearances and the EPP downlink) will allow the sector capacity to increase. But this shift to TBO can only be done when a fast and reliable broadband A/G datalink is available.
#41	Are already technical standards for LDACS available?	Michael Schnell Standardization is currently taking place in ICAO under the Communications Panel. Draft SARPs have been endorsed. With respect to a complete technical specification, this has been developed within the SESAR framework and will be input to ICAO to become part of the so called LDACS manual.
#42	Is there an agreed and updated roadmap for the deployment of LDACS globally?	Philippe Sacre ICAO GANP, SESAR Master Plan mention LDACS but actual deployment decisions will be taken based on business case
#43	Does LDACS implementation requires to retrofit forwardfit avionics equipage?	Philippe Sacre Avionics need an update. The LDACS Avionics task force is looking at how to minimize impact, for instance with multimode VDL/LDACS radio.
#44	What would be a typical sector size?	Philippe Sacre See webinars 2 and 3 about cell size and deployment. Vaughn Maiolla LDACS cell-size and sector size will be independent of one another – as handover from one LDACS base station to another will be automatic.

#45	What is the actual data rate per sector (on average) with LDACS	Ruben Flohr We'll address the question in the second webinar.
#46	Due to security reasons many Airports are using instead AeroMacs state agreed TETRA solutions for G-G (under different names). Can LDACS replace this and harmonize G-G communications also?	Philippe Sacre The main purpose is for mobile coms. You can always use it for fixed comms as well but this is not the use case we work on Vaughn Maiolla Small airports may not justify the deployment of a dedicated data link such as AeroMACS, in these cases LDACS can by used for communication with the aircraft while on the ground as is done with ACARS today.
#47	The EFB is still not part of the Certified Aircraft Avionics Domain!	Agreed.
#48	Does LDACS focus just on the transmission or are also the additional components defined such as user authentication (e.g. SIM), home location register, roaming, ...	Philippe Sacre Security, mobility functions etc… are defined in LDACS standards. Inclusion of LDACS in the IPS based standards also manage the roaming, multilink etc.
#49	Plenty of Airports are providing already good Com G/G solutions to airlines and home carrier, on top of Aeromacs	Philippe Sacre True, LDACS can be used at airports but the main scope is ENR; a multilink system shall cover the whole flight.
#50	Would LDACS be used also for transmission a data like AMDAR from aircraft to GND station?	Philippe Sacre Indeed, for ATS and AOC
#51	Good promising promotion, but What does it costs and is a CBA available?	Philippe Sacre The CBA is being developed now with deadline in autumn
#52	In Europe we have still not solved the Datalink disaster, now satcoms and LDACS: what shall an Airline install and buy?	The business case LDACS/SATCOM/MULTILINK is being developed to try and answer those questions
#53	Can you pl compare the LDACS and EAN (European Aviation Network) What are the advantages...	Philippe Sacre Look at the SESAR solution 61

#55	If both ANSP (CNS/ATM) and AOC will be available by the same LDACS communications system - can some fields be shared between all partners in future? - AI based control and separation needs also some AOC technical data (much more online data than manned control today).	LDACS can segregate and prioritize flows contrary to VDL2
#56	What is the minimum necessary data to be transmitted for safe, efficient, and effective flights?	This is not an LDACS specific question.
#57	IATA Presentation, surprising to start from AOC needs instead of ATS ones. ATS services will have to be protected against AOC ones.	Michael Schnell Other than VDL2, LDACS makes available priorities. Safety- and time-critical ATS services are always prioritized over AOC.
#58	Contrary to SITA or Collins current VLD2 systemas, will this be an open proprietary technology available for competitive service provision?	Philippe Sacre This is an open standard that any implementer can use for development
#59	Do these uplink and downlink messages already exist, if necessary?	Philippe Sacre If the question is for AOC? Yes AOC is widely used already and the traffic is increasing hence a need for more capacity
#60	It will take years to have avionic parts certified to be used in the cockpit. What timeframe is envisioned to use LDACS at least for 50+% of the Commercial/Business Aviation traffic?	Philippe Sacre Timelines to be discussed in W3
#61	If understood correctly, LDACS needs a frequency allocation plan, is there an estimation of the minimum number of frequency channels that are required for the deployment?	Michael Schnell Frequency re-use envisaged is 7; to be on the safe side we consider around 15 frequencies. See webinar 2
#62	Assuming LDACS is selected, what is the expected/likely deployment timeline for wide use in e.g. Europe?	Deployment roadmaps and possibilities to be discussed in webinar 3.

#63	Are the presentations shown available at any time or are they distributed by e-mail?	Philippe Sacre This will all be available on SJU web page, even recording.
#64	Is there kind of Commercial Payload using LDACS foreseen for future (video, photos, measured environmental data etc. transmission)?	Ruben Flohr LDACS is reserved for aeronautical applications only. I could imagine it to support ad hoc videos and photos transmission between AOC and cockpit, but restricted to operational use only. Download of environmental data may indeed become relevant, for example regarding humidity, pressure, outside temperature, as input to contrail prediction and avoidance.
#65	What is the intended time horizon for the implementation of LDACS?	Michael Schnell Currently, ICAO standard applicability is planned for 2024. Due to COVID-19, this might be slightly delayed.
#66	If understood correctly, LDACS needs a frequency allocation plan, is there an estimation of the minimum number of frequency channels that are required for the deployment?	Philippe Sacre We will see this in Webinar 2 Joan
#67	Can LDACS be used as data link for SBAS?	Philippe Sacre For GBAS several studies have been made and are on-going.
#68	What about resilience of and contingency measures and systems?	The issue of robustness of integrated CNS including LDACS and other systems is being studied in SESAR among others, solution 76
#69	Who is responsible for the operation and who is responsible for the data sent?	This is not changed compared to current practises. The actual COM or CNS service provision will however address this point in due time.
#70	How will be complex LDACS retrofit? Does it requires additional antennas for an aircraft?	Michael Schnell We try to minimize the impact of a retrofit by re-using existing infrastructure on-board as far as possible, e.g. having a combined VDL2/LDACS avionics box and exchanging a VHF antenna with a combined L-band/VHF antenna. This way, LDACS can be viewed as broadband extension to VDL2. This has the nice effect that you can start using LDACS as soon as the LDACS ground infrastructure is being deployed. Where LDACS is not yet deployed, you can still use VDL2.

#71	Hello, Do we expect some Service provider (CSP) to operate LDACS (like SITA and ARINC) or it will be deployed by ANSPs? Thank you, Ainars	Philippe Sacre Service provision to be discussed in Webinar 3.
#72	Just to remind a close domain, navigation: the full connectivity is already there and provided by satellites (GNSS). Why can't it be the case for Com from the speaker perspective?	Philippe Sacre Indeed, the SATCOM option is envisaged in the FCI business case, like in the multilink option. GNSS arguably requires a ground backup which is DME or could be DME/LDACS, being discussed/studied at this time.
#73	The evolution path to full connectivity is understood, but what you are not explaining is why this should be conducted through LDACS, and not through other technologies such as satellites? Is this formal ICAO position?	Philippe Sacre Same as 72. I cannot speak for ICAO in this reply, but it was not mentioned LDACS was THE choice at this time. Vaughn Maiolla / ICAO Satellite systems can only be considered a compliment to terrestrial communications systems. LDACS is scalable whereas satellites systems are not (during the lifetime of the space segment). Satellite systems will provide more bandwidth however the latency and availability of these systems cannot meet the most demand requirements of the future communications infrastructure. A satellite constellation also represents a single point of failure which depending on the nature of the failure could have a MTTR of many weeks, affecting a large region. This is clearly not acceptable for a key economic driver like civil aviation.
#74	In terms of data link - is LDACS intended for IPS only, or also OSI?	Philippe Sacre T LDACS can support both, this is being discussed at that time within the SESAR related projects :)
#75	Why not using directly LTE or 5G	Philippe Sacre They are not standardised for aviation and not using protected spectrum. HOWEVER the use of these commercial technos is being researched in SESAR for the moment (wave 2 solution 61) Ruben Flohr This answered was answered more elaborate live during the panel discussion

		Vaughn Maiolla 5G or LTE may be acceptable in some operational environments however most commercial systems are not designed to meet the RMA requirements of safety critical service, such as ATM. 5G has many exciting capabilities such as 100Mbps+ comms, however there has been no operational need for such service. 5G can support this level of capacity by using spectrum that is only suitable for short range communication. This spectrum not only has limited range, calling for a very large deployment but also is very susceptible to rain fades.
#76	LDACS is using L-Band with OFDM signals - can this be used for multilateration? Can we add additional WAM/MLAT surveillance layer to current 1090 MHz (positioning all LDACS users in air and at ground).	Philippe Sacre In principle this is possible, surveillance applications start being examined now after the COM and the NAV capabilities that have been demonstrated.
#77	How the system could influence the workload of ATC controller and pilots as well?	Datalink applications supported by LDACS have the goal to increase ATCO productivity/efficiency/capability to cope with traffic
#78	Is the transporte rate between two participants guaranteed?	The system is not similar to VDL2: the data rate is guaranteed and can be adapted by different modulation schemes and deployment cells
#79	Do you anticipate making this available for unmanned aircraft as well - not just HALE/ MALE/ UAM, but also sUAS/ Specific Cat?	Philippe Sacre LDACS has been proposed at ICAO RPAS panel for this possibility indeed.
#80	Can LDACS support also UTM/U-Space/UAM? At least the certified category?	Philippe Sacre LDACS has been proposed at ICAO RPAS panel for this possibility indeed.
#81	Is it possible to assess at this moment quantitatively the added value of LADACS?	Philippe Sacre We are doing a business case at this moment so YES.