

Chapter 4: Incentives (Report of WG1) (version 3.0).

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Chapter 4: Incentives (**Report of WG1**) (version 3.0).

4.1. Introduction

The rationale behind this work is to give information to ICAO how the implementation of the ASBU can be encouraged, in particular to stimulate early investors in new concepts and technologies. The following tasks are addressed in this chapter:

"Identification of best practices for incentives (including operational and financial incentives) supporting the implementation of ASBUs:

- 1) Identification of the different types or level of service priority;
- 2) Identification of operational policies that are currently used;
- 3) Identification of the different type of incentive;
- 4) Evaluation, to the extent possible, of the effectiveness of the afore-mentioned;
- 5) Identification of the stakeholders impacted by the ASBUs implementation and the geographic level in the implementation;
- 6) Consider the aspects of equipage, training, certification and operational approval, etc.;
- 7) Elaboration of common definitions."

As a better understanding of definitions is needed, this item (7) is subject of paragraph 3. The items (1), (2) and (3) are mentioned in paragraph 4. Item (4) is subject of paragraph 5. Items (5) and (6) are dealt with in 6.

4.2. Products

These tasks have to result in concrete contributions to the work of ICAO. The following products are foreseen:

- a. As implementation of the GANP/ASBU is the main theme for ICAO, this should lead to a text in the updated version of the GANP/ASBU, based on the major outcome of WG1 and the other WGs. This text in the GANP can then refer to other related documentation and guidance material.
- b. Input to other existing documents (TBD)
- c. Report of WG1 with an overview of all relevant information

Deliverable	Document	When	Comment
Guidance on operational and financial incentives			
Contribution to the performance of the aviation system	GANP	May	Comes back in best practices
General notion about encouraging implementation	GANP	July	Further to be worked out in other documents
General notion about collaboration and cooperation	GANP	May Sep	Input from Best Practices

Inventory of best practices in existing operational and financial incentives	Guidance document	May July Sep	End report of WG1
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4.3. Elaboration of common definitions

4.3.1. Introduction of incentives

The overall objective being the implementation of the GANP/ ASBU, incentives are a means to induce the relevant stakeholders to invest in time in a co-ordinated, synchronised manner:

- to commit resource on the desired roadmap.
- to encourage early action to create the critical mass.

Incentives can take different forms. Primarily they can be classified as:

- Operational (i.e., applying an action-based form of quid pro quo)
- Financial (i.e., applying cash form of quid pro quo)
- Regulatory (i.e., rulemaking –quid pro quo with a stick; but can also set conditions to apply incentives)

For the purpose of this paper, only the first two types of incentives are defined.

The application and impact of incentives can however be influenced by regulatory measures (in a State) or international agreements (with more States) to describe the conditions under which the incentives will be used. This will be dealt with in chapter 4-d.

It is important to understand that incentives don't change the general behaviour of the industry (airspace users, airport operators, air navigation service providers) in terms of reaction to market, context and business evolution, but can affect the timing of their actions. Furthermore, it is important to understand that incentives need not only apply to the deployment of ground or on board technology. In order to realize new benefits it is often equally important to enable operators to share new information, provide new training to operational staff (e.g. ATCOs, aircrews), or adjust automation processes and procedures. For this reason it is useful to think about the role of incentives in terms of influencing new capabilities, rather than just new equipage.

In aviation incentives can:

- Contribute to improving the performance of the aviation system (performance in the sense of better capacity, more efficiency, contribute to safety, environment, etc.);
- by encouraging the implementation of specific improvements, such as an ASBU module or complementary ASBU modules and;
- enhancing the collaboration and cooperation among stakeholders;
- Apart from regulatory measures the two main categories of incentives are operational and financial ones. They can take several forms as demonstrated in the compiled inventory of best practices in existing operational and financial incentives (see chapter 4.3).

4.3.2. Operational incentives

Operational incentives aim to reward stakeholders who invest in operational improvements by granting the operational benefits. More specifically they allow or give priority to more capable flights to operate in a manner that makes best use of the stakeholder's investment (equipment and training) hence achieving optimal performance or service improvement

With operational incentives it is ensured that deploying stakeholders (often Airspace Users) receive tangible benefits as soon as possible, not when everyone is fully equipped, but potentially right from day one or when a critical mass is reached.

For instance, one example of an operational incentive could be to introduce a Best Equipped Best Served (BEBS) policy. This addresses the last mover advantage and ensures innovators and early adopters of new capabilities are rewarded over those that invest in lower capability levels while ensuring consistently safe and efficient operations. In practical terms, BEBS would not substitute, but instead complement the First Come First Served principle, potentially resulting in delivering a preferential operational service. Combined possibly with a lower ANS charge to Airspace Users that have reached higher capability levels, this concept could provide significant monetary and non-monetary performance gains to Airspace Users (e.g. via fuel and ANS cost savings). Access to particular routes, flight levels, prioritisation and clearance processes could be explored as possible operational incentives.

By definition, operational incentives provide better service to more capable aircraft. Given that not all aircraft may have the same capabilities, the benefits from an operational incentive can be uneven among aircraft operators and may affect the Air Traffic Management system in unintended ways. In some mixed equipment environments, the application of an operational incentive may favour the more capable aircraft over the less capable aircraft.

However, operational incentives need not necessarily disadvantage non-capable aircraft. The use of DataComm for pre-departure clearance, for instance, could benefit a single capable aircraft without impacting the operations of non-capable aircraft. If the associated benefit from an incentive does not require a large percentage of surrounding aircraft to be equipped, early adopters of a technology/procedure can realize a benefit from an operational incentive without having to first ensure a "critical mass" of capable aircraft.

On occasion, it may be necessary to establish a non-mixed equipment environment so that aircraft operators can realize the benefit of equipment. To minimize the disruption to non-equipped operators, it is sometimes possible to limit the scope of the non-mixed environment and still produce user benefit. For instance, a new navigational route (requiring special equipment and procedures) can be made available on one of two parallel runways. In this case, non-capable aircraft could still access the airport while enabling operational improvements and increased system efficiency. In addition to the equipment required, operators would need to be trained in new procedures and approach paths (including knowing when to request those approaches from air traffic control) in order to achieve the desired capability, but all operators in the area could potentially benefit.

At other times, it is not as possible to minimize the disruption to non-equipped operators and ensure that the equipped operators can realize the benefit of equipage. In these cases an operational incentive that segregates the airspace by capability will, in the short-run, benefit certain users at the expense of others.

If, for instance, an ANSP wanted to demonstrate the benefits of a new RNP arrival route into a busy airport, it might be necessary to ensure that, for some period of time, only capable operators would be operating in the area. In this case non-capable operators would experience reduced access to the airport. This type of operational incentive increases the rate of capability where/when it is instituted as the disparity in benefit between a capable operator and everyone else becomes more pronounced.

However, there is also a risk of reducing overall system efficiency in situations where large exclusion zones are established and there are only a small percentage of operators capable of using a particular technology or procedure. These situations may arise when an ANSP or State dedicates a segment of space (e.g. an altitude level, a runway, an airport) for use by aircraft in which a unique type of capability is being incentivized. If, for instance, a substantial portion of the optimal altitudes along major routes is reserved for capable aircraft and not many of these aircraft are present, the air traffic management system as a whole could become less efficient until such time as the required capability was more widely adopted.

4.3.3. Financial Incentives

Financial incentive aim to support stakeholders to invest in operational improvements – e.g. in case of a negative cost benefit analysis (CBA) or low return on investment (ROI) or to elicit certain behaviour from an airspace user. These incentives can be structured as a loan program, a financial grant, or implemented through a charging scheme to encourage users to act in ways that will lead to the desired outcome.

In the context of air traffic management (ATM), a charging scheme might consider three types of pricing incentives, according to the different time horizons of the State.

The first type would affect the users' tactical or operational decision at the level of each flight in terms of timing, routing or flight profile. Although tactical decisions are often made without consideration of such incentives, it is conceivable that, for example, in a congested airspace, some users would be willing to accept a less optimal flight profile in exchange of some form of financial remuneration. Depending on the circumstance, such incentives may even out traffic flows and reduce the overall cost of the provision of service.

The second type would target the demand for ATM services by affecting users' decisions regarding their services, for example, with respect to scheduling or fleet allocation. Charges for air navigation services could be modulated in such a way that higher charges would apply during peak periods when demand for ATM's limited capacity is greatest, and lower charges would apply during off-peak hours.

The third type would affect users' decisions on investments in new technology for on-board equipment. Experience has shown that users tend to defer investment in aircraft equipment as much as possible; They prefer short term savings (deferring an investment) to less certain collective benefits that are dependent on the synchronization of ground and on-board equip-

ment investments. Therefore, incentives for early adoption of on-board equipment may help support the implementation of new technologies and, over time, could contribute to a better adjustment of ATM capacity to the needs of the air transport industry.

These types of incentives have a direct impact on financial aspects and can have a major effect on investors' appetite to proceed with deployment. Other forms of financial incentives may involve direct public funding contributions in the form of grants or subsidies, targeting specific stakeholder groups, facing serious financial challenges (e.g. negative CBA, limited financing capacity). Such direct public funding support could be envisaged both for ground, but also for airborne capabilities.

Furthermore, public funding support can be provided in the form of credit guarantees to enhance existing private financing channels (e.g. improving credit ratings and lowering repayment risk).

Additional financial incentives can be structured in the form of new deployment funds, potentially providing loans at reduced/subsidised rates of interest and favourable repayment schedules, or in the form of modulated charges or the creation of a supporting charging collection mechanism.

4.3.4. Operational and financial incentives differ, but can be used complementary, if needed

Operational incentives differ from financial incentives in that they provide operators with some benefit or savings in the operation of an aircraft, rather than directly or indirectly through financial penalty or rewards (e.g. loans, and grants). While financial incentives aim to increase capability by supporting the deploying stakeholder on the cost side, operational incentives are structured toward ensuring or increasing the operational benefits for deploying stakeholders, i.e. optimise the value of new capabilities once they are on-board an aircraft.

In some circumstances, operational and financial incentives can be complementary activities, each attempting to increase the adoption rate of new capabilities through different means. One instance in which incentives can be used to support each other is when they are applied as part of a pilot program or proof of concept; in such situations, aircraft operators are financially compensated for the cost of new equipment and given access to the operational environments necessary to accrue benefits. At times, it may be necessary to employ both types of incentives to overcome user concerns about new technologies and demonstrate their utility to a wider audience. In these situations, employing both types of incentives simultaneously can help effectively address the phenomena known as last mover advantage.

Finally, an appropriate definition (development and execution) of incentives would also need to envisage broader aspects in relation to the transition towards final implementation, particularly the regulatory framework. This is dealt with in [chapter 4-d](#).

4.4. Identification of best practices for incentives (including operational and financial incentives) supporting the implementation of ASBUs

4.4.1. Identification of incentives

In this chapter the work with incentives is further addressed, starting with some notions about working with incentives. An overview has been made in the form of a long table with examples of best practices. This is not exhaustive and in a next report more analysis will be given related to these examples, and if necessary other examples will be added. This also shows that incentives can be applied in different ways. This report is related to the implementation of the ICAO GANP/ASBU. As needs and circumstances differ over the world, the type and impact of incentives may differ as well. Out of the information gathered some more generic aspects are taken into account, related to:

- a. Incentives in the context of general implementation of the GANP/ASBU
- b. the different types or level of service priority;
- c. operational policies that are currently used;
- d. the different types of incentive.

Although this progress report speaks a lot about incentives, it should be realised that the general issue is to implement the GANP/ASBU at the right place, time and scale. Several ASBU elements will be implemented based on positive business cases and stakeholders seeing the benefits will take action, without the need to introduce an incentive. In other cases implementation is hampering or benefits are sub-optimal, at least for a certain period. In this chapter attention is paid to these kinds of situations. This information may lead to guidance material from ICAO. Incentives are a tool, but are often part of set of actions to achieve and speed up implementation.

In order to address the deployment challenge, this may require the concurrent use of several incentive tools, Financial and Operational, which together with other deployment governance (organise cooperation and collaboration) and regulatory constructs could result in achieving a timely and synchronised implementation across stakeholders and regions.

4.4.2. The challenge of implementation

In today's environment and drawing lessons from the recent history of ATM modernisation worldwide, there are several factors that can result in a partial or delayed implementation of ASBUs:

- "last mover advantage";
- no or limited pressure on stakeholders to respect deadlines and constraints in agreed plans;
- lack of consideration of different business cases / plans of stakeholders bearing the investment costs;
- inappropriate or de-synchronised planning or deployment of new technologies

- agreements or regulation are often needed to achieve synchronisation, however, regulation alone is not always sufficient;
- ambivalent behaviour from certain States and stakeholders, who approve investments they do not ultimately implement locally as originally planned; and
- lack of incentive at the centralised level to accelerate adoption and increase network benefits;

One of the key issues associated with the deployment of substantial ATM improvements, such as the ASBUs, is the so called last mover advantage problem. This is where it is financially advantageous (i.e. an incentive) for stakeholders not to make deployment investments until the closest possible moment before network benefits accrue or until after benefits begin to accrue. This potentially disrupts the implementation for improvements that require a large number of stakeholders to invest.

Central to this deployment challenge is the lack of sufficient co-ordination and synchronisation of investments across all stakeholder groups. If airborne and ground investments are not synchronised, this can lead to the realisation of reduced, deferred, or unevenly apportioned performance benefits for the deploying stakeholder, and for the network as a whole.

Stakeholders can react to anticipated changes through:

Scenario	Strategy
Forward-fit	When possible, anticipate future capability requirements
Retro-fit	Defer modifications as much as possible in time to reduce risk and maximise return on investment (“last mover advantage”)

Benefits for new air traffic system improvements generally arise with a time lag, several years after the original investment has been made; these benefits are sometimes dependent on sufficient equipage and synchronisation across all stakeholders (airborne and ground investments). On this basis, early adopters and innovators are essentially penalised for investing first.

Furthermore, deployment could be impeded by insufficient governance arrangements to ensure a “smooth” deployment phase amongst all actors involved. For instance, there could be no or limited pressure on stakeholders to respect deadlines and constraints in agreed deployment and performance plans, giving rise to a subtle incentive for stakeholders to adopt an ambivalent behaviour and renege (with subsequent infringement proceedings needed to be launched).

In addition to this, at the regional/network level there can be inappropriate deployment planning, partly due to information asymmetry or lack of consideration of the different business models/cases/plans of stakeholders who bear the investment costs.

In cases where several States and stakeholders are involved, agreements between parties or regulation are often needed to achieve synchronisation. For instance, in certain regions where FIRs are fragmented, or where there is no SESAR/NextGen equivalent to the ASBU, (sub-) regional coordination is required to agree on what of and how the ASBUs will be implemented by concerned parties. As if it otherwise may result in an ad hoc and piecemeal manner, the benefits of harmonisation and interoperability as envisioned will not be realised. Even with

good intentions to implement something by several parties, it is necessary to avoid that everyone is waiting for the other, As is not sure if others will take action as well, coordination and collaboration has to be organised.

However, regulation alone is not always sufficient. The setup of clear governance mechanisms at all political, management and implementation levels can be of paramount importance, in order to decide upon, manage and implement the deployment phase of ASBU modules.

Last but not least, an important issue for consideration is the inadequate financing capacity of certain investing stakeholders. Whether due to lack of available cash/liquidity or corporate profitability, restricted access to capital or limited financing channels, investing stakeholders can be faced with important financial challenges.

Certain deployment investors may be faced either with a negative Business Case, CBA or project Net Present Value (NPV). Even in a positive case, investment returns could be low, with long payback periods.

One final note to close the loop on the deployment challenge: not only are there several issues from the point of view of stakeholders in deploying the required investments, there can also be an issue from the point of view of the regional authorities. In particular, there can be lack of commitment at regional level to accelerate deployment and increase network benefits, potentially due to strong political / stakeholder pressures and vested interests bearing an effect. In this context, appropriate mechanisms for cooperation can be considered not only for deploying investors, but also for the regional authorities in charge of overall deployment. For the purpose of this paper, this latter set of incentivisation mechanisms for the “creator” of incentives himself will not be addressed.

4.4.3. Inventory of best practices in existing operational and financial incentives

When conducting an inventory of incentives, it is useful to organize these incentives based on the following information so that cross comparison can be made with relative ease. The following organizational structure is suggested:

- **nature:** operational/financial/both; where applicable, short description of financial instrument and criteria;
- **geographical area;**
- **date(s)** of application: the dates can also be defined with respect to the achievement of a certain level of dissemination of the desired capability;
- **beneficiaries** / populations concerned; conditions of application:
 - airspace users: aircraft/fleet defined with respect to e.g. mass, nature of operations; flight regime; crew qualification; forward fit and retrofit can be addressed specifically;
 - participating ground ATM services/systems;
- **purpose** (why an incentive):
- **ATM performance impact** and change it makes to the ATM system; impact on Air Traffic Control operations; what type of performance improvement is sought (capacity, efficiency, safety, environment), and how is this monitored;

- **exemptions** if any; description of what happens to non-compliant flights; procedures for non-nominal situations affecting flights or ground equipment;
- necessary **regulatory provisions**, if any; criteria used to apply the incentives and reference to any special policy or regulatory decision needed to apply the incentives;
- airborne and ground (and space) **equipment/capability** essential to be put in place so as to ensure benefits are generated;
- **business case** brief description of the main arguments and key figures;
- actions needed to get **cooperation/collaboration** of parties involved, and where relevant, specific responsibilities of these parties;
- where relevant, wider **programme** in the **context** of which the action is/has been taken;
- where relevant, **relationship to GANP/ASBU**;
- relevant **remarks** on effectiveness of the incentive, based on return from experience.

The inventory overleaf is organised to reflect the characteristics in the definition above.

It highlights the specifics of the listed examples, in particular those of the environments and ATM changes. The resulting bottom-up catalogue will then be used in turn to generate more top-down guidance for future changes as proposed by the GANP.

As important are those ATM improvements not accompanied by explicit incentives: they deliver benefits to their users, with no attempt to accelerate the migration to the improved capability compared to the “natural” pace. Some may also be “transparent” to the users, e.g. a new route network.

So, the table below does not include the following:

- CDO/CCO: can be performed by suitably equipped a/c and trained crew at airports/times allowing it. Operational benefits are for the airspace user; airports are encouraged to put the procedure in place, but no incentive has been established to increase the number of CDO/CCO. Only guidance on actions to take to implement and peer emulation.
- Route network and free routes: even in the European context where the performance scheme has set a target on the extra route length the deployment can hardly be seen as an incentive to motivate individual airspace users, unless some routes/routings would be reserved for certain navigation capabilities.

The practices mentioned in the table are from the pre-ASBU period; therefore they were applied without direct reference to the ASBU modules. The examples cover several performance areas: Capacity, cost-effectiveness, flight efficiency, safety and environment. These are linked to the most important key performance areas distinguished by ICAO. Giving the type of activities and performance areas, the link with the relevant ASBU modules has been added in the table.

The list is not exhaustive, but based on information received. The beneficiaries show, they are either airspace users or ANSPs or both.

The vast majority of the examples is referring to operational incentives. Financial incentives may however become more important in the coming years, as for instance in Europe the De-

ployment of SESAR is supported by financial instruments, including incentives. Also the US has reserved finances for the implementation of NextGen.

The examples from Europe and Asia refer to a situation where several States and their ANSPs are involved. In many cases the airlines are seen as the beneficiaries, but it will require the involvement of ANSPs to provide substantial work. Also the US examples relate in most cases to a vast amount of airspace or to complex parts of airspace (Metroplex), indicating they either a big geographical scope and/or the involvement of several stakeholders.

The table also indicates that many incentives come with regulatory measures, but that there are also cases without the need for that.

The examples cover a wide arrange of performance areas. Flight efficiency and capacity are often served with operational incentives. The examples of financial incentives in US and Europe are linked with specific programmes and most of them based on business cases. In Europe more than in the US, due to its involvement of several States and several ANSPs, the programmes are supported by legal arrangements to address the required commitments.

It has to be reminded that for major implementation projects of NextGen and SESAR, dealing with the same issues as the modules of the ASBU, work is in progress, Incentives will play a role, but cannot be described yet at this stage. More examples can be given in future.

Name	Nature	Area	Date	Beneficiaries	Purpose	Performance	Regulatory provisions & exemptions	Capability	BC	Cooperation collaboration	Context	GANP ASBU ref	Remarks
LINK 2000	FIN	EU	Call for proposals to airlines volunteering to equip some aircraft. Funding limited to 20% of avionic cost	Volunteer airlines	Create a pioneer fleet and ensure initial operations	Capacity, flight efficiency, safety	Y	CPDLC on VDL2	Depending on airline	Slow progress towards achievement until Implementing regulation (IR) in place. Route charge based incentive scheme could not be agreed in time. Before IR: recurring slippage due to lack of ANSP commitment and consequent Airline investment. After IR: Commitment much improved from all concerned parties, Appropriate communication and support to the Stakeholders, including EASA and industry.	SES	B0-TBO	This is an example of gradual deployment with mixed fleet with long lead time to get benefits. For this change, the benefits are not sufficient for individual stakeholders to make positive deployment decisions alone. Lack of incentive scheme and regulations made its initial progress very slow. IR and incentives are now making the coordination more effective and the progress steadier.
PENS	OPS?	Participation on a voluntary basis		ANSPs		Cost, expandability	N	ground IP communication backbone	Economy of scale	Well bounded project, benefits easy to demonstrate Smooth transition possible with/from legacy systems Selected arrangement proved to be a pragmatic programme			clear benefits to users Realistic governance involving all users Appropriate cost sharing mechanisms
SESAR Deployment	FIN OPS	EU	Deployments between 2015 and 2020	Priority on functionalities that have longer pay-back times (typically key infrastructure elements) and stakeholders that have a negative CBA (ANSPs and Airports principally). Specific solutions for airspace users	Grant to facilitate synchronised and more rapid transition First application of BEBS Differentiated charging mechanism Very Large Scale demonstration activities to establish "initial critical mass" by bridging	Capacity, cost-effectiveness, flight efficiency, safety, environment	Y	Several functionalities	Is a condition of accepting projects	Creation of a Deployment Manager role to coordinate local projects	SESAR	several	

Name	Nature	Area	Date	Beneficiaries	Purpose	Performance	Regulatory provisions & exemptions	Capability	BC	Cooperation collaboration	Context	GANP ASBU ref	Remarks
					R&D and deployment								
SESAR Development	FIN	EU	SESAR 1: 2008-2016; SESAR 2: 2014-2020	Industry	Grants to ensure better and faster validation and move to implementation phase; economies of scale and wider acceptance of products prepared in common by different partners	Capacity, cost-effectiveness, flight efficiency, safety, environment	Y	Several functionalities	Defining/validating the BC is part of the programme	Progressed via a public-private partnership, with co-funding from EU Research budget	SESAR	several	
SESAR, ASPIRE, INSPIRE, etc Demonstrations	FIN OPS	Various agreements		Airspace users, ANSPs	Subsidised demonstrations to become part of normal operations if successful	Capacity, cost-effectiveness, flight efficiency, safety, environment	N	Several functionalities		Attract some stakeholders, demonstrate in real conditions, move from demo to ops where possible, enlarge participation		several	Continuity in operations after the demonstration is not a regular practice
TCAS	none	ECAC	Agreed single operational date	Airspace users	Decision taken by States for safety reasons	safety	a/c regulation by key States	TCAS	Y	Extensive communication on what is to be done, and by when Progress constantly monitored Closed interaction with ALL actors			Success achieved, with a transition period (2 years) Benefits understood and agreed
RVSM	OPS	ECAC	Extreme synchronisation Single D-day obtained by wide consensus	Airspace users, ANSPs	Segregation of non-compliant aircraft	Capacity & flight efficiency	aircraft regulation by key States	RVSM	Y	Extensive communication on what is to be done, and by when Progress constantly monitored Closed interaction with ALL actors Integrated programme management cell			Benefits understood and agreed
EAD	OPS	ECAC	Ongoing; States join progressively the EAD	Airspace users, ANSPs	A common AIS data base, greater access, greater quality, economies of scale in AIS/AIM	Cost-effectiveness & safety	N	Digital AIM	Y	Vehicle for interoperability and promotion of the AIXM as ICAO (global) standard		B0-DAIM	Clear business case and institutional framework, however, transition period longer than expected: local transition issues, mainly due to legacy systems and lack of resources. Obligation through ESSIP proved not effective enough to fully commit to a full transition date
ADS-B ITP	FIN OPS	Southern Pacific Routes	Ongoing trials, ITP operational in 3 coastal	Capable Pacific cargo carriers, ANSP	Enable more efficient operations	Fuel savings, increased cargo capacity	ADS-B mandated by 2020	DO-260B ADS-B avionics	Defined as part of the program	Established through agreements between an FAA program and specific private enterprises. Terms negotiated	FAA ADS-B Program	B0-OPFL	

Name	Nature	Area	Date	Beneficiaries	Purpose	Performance	Regulatory provisions & exemptions	Capability	BC	Cooperation collaboration	Context	GANP ASBU ref	Remarks
			centers by 2017							within the context of the specific program.			
East Coast ADS-B	FIN OPS	Routes along US east coast	Ongoing evaluation, complete 2014	ADS-B capable commercial airlines	Increased capacity / efficiency in poor weather	Reduced delay during radar outages	ADS-B mandated by 2020	DO-260B ADS-B avionics	Defined as part of the program	Established through agreements between an FAA program and specific private enterprises. Terms negotiated within the context of the specific program.	FAA ADS-B Program		
ADS-B in the Gulf	FIN OPS	Gulf of Mexico	Ongoing operations, upgrades complete 2015	Aircraft operating in or across the Gulf of Mexico	Additional surveillance and comm in non-radar areas	More efficient routes and increased helicopter capacity in the Gulf	ADS-B mandated by 2020	DO-260B ADS-B avionics	Y	Established through agreements between an FAA program and specific private enterprises. Terms negotiated within the context of the specific program.	FAA ADS-B Program	BO-TBO	
OAPM	OPS	Multiple metroplexes in the US	Continuous procedure development	Capable operators	More efficient procedures into high capacity airports	Increased efficiency, fuel savings, improved capacity, reduced delay	N	Various levels of RNP		Consistent engagement with local communities as well as frequent explanation of overall strategic plans to FAA managers and oversight agencies.	NextGen	several	
De-Confliction around Metroplexes	OPS	Metroplex pairs in JFK/LGA, MDW/ORD	Concept of operations complete 2013, implementation TBD	Capable operators	Improved metroplex efficiencies	More efficient routes, reduced delay during constrained timeframes, reduced fuel burn, increased capacity	N	RNP .3 AR		Public meetings were held to receive input on defining the concept and approach for various operational incentives, including the proposal for de-conviction of routes.	NextGen	several	
Greener Skies over Seattle	OPS	Routes around the Port of Seattle	Continuous operations	Capable operators	More efficient procedures into Seattle	Increased efficiency, fuel savings, improved capacity, reduced delay	N	RNP	Y	Significant involvement in route development with early equipped operators, as well as with the local community around Seattle.	NextGen		
DataComm Financial Incentives	FIN	N/A	Incentives applied in stages through 2017	Various participating airlines, avionics manufacturer	Increased DataComm capability, sufficient to start accruing benefit	More efficient operations, with varying efficiencies between now and 2022	N	FANS 1/A+	Y	Agreement reached with an avionics manufacturer who then oversees the installation of a require number of avionics in the U.S. fleet.	FAA DataComm Program		
ATFM over Bay Of Bengal	OPS	Bay of Bengal, India, Pakistan, Kabul.	Agreed Single date	Participating airlines (all)	Slot allocation through Kabul FIR to prevent bunching and delay	Reduced delay at departure airports and improved access to optimal levels	Y			Regional agreement among ANSPs to apply procedures. Airlines agreement to comply.		BO-NOPS	
CRA Bay of Bengal	OPS	Bay Of Bengal	Agreed Single	All FANS	To implement ADS-C/CPDLC	Horizontal separation	Y			Regional agreement among		BO-	Under ICAO APAC auspices

Name	Nature	Area	Date	Beneficiaries	Purpose	Performance	Regulatory provisions & exemptions	Capability	BC	Cooperation collaboration	Context	GANP ASBU ref	Remarks
			date	equipped aircraft	and reduced horizontal separation	reduction to 50/50nm				ANSPs. Agreement between IATA, India and Boeing for collection of funds from airlines to fund CRA activities		NOPS	
RVSM	OPS	Asia Pacific	Agreed single date for each area		To implement RVSM	Capacity and flight efficiency	Y			Regional agreement. Done in 3 stages. Bay of Bengal, South China Sea, and Japan/Korea			Under ICAO APAC auspices
Reduced Horizontal Bay of Bengal	OPS	Bay of Bengal	Agreed single date	FANS equipped aircraft	To implement RNP10 and RNP 4	Capacity and efficiency	Y			Regional agreement among ANSPs and users		BO-OPS	Under ICAO APAC auspices
Reduced Horizontal Separation SCS	OPS	South China Sea	Agreed single date	FANS equipped aircraft	To implement RNP10 and RNP4	Capacity and efficiency	Y			Regional agreement among ANSPs and Users		BO-OPS	Under ICAO APAC auspices
ADSB SCS	OPS	South China Sea	Agreed single date	ADSB equipped	Implement Surveillance separation	Capacity efficiency and safety	Y			Bilateral Agreement between Vietnam and Singapore		BO-ASUR	Agreed funding between Singapore and Vietnam
Establishment of user preferred route (UPR) Geographic zone in Chennai FIR and Mumbai FIRs	OPS	Arabian Sea, Indian Ocean,	Agreed Single date October 2013	Airspace Users- All participating aircraft	To implement User Preferred Routes across the Arabian Sea, Indian and Southern Oceans and adjoining airspaces.	Capacity and Efficiency	Y	RNP 10 And FANS equipped aircraft	NO	Informal group similar to ASPIRE Program, comprising of African, Mid East Asian, South East Asian States and Australia, Airlines formed known as INSPIRE (Indian Ocean Arabian Sea Strategic Partnership to Reduce Emissions).		B0-TBO	Under Arabian Sea Indian Ocean ATS Coordination Group.
preference for optimum flight level for suitably equipped aircraft in Chennai and Mumbai FIRs	OPS	Bay of Bengal, Arabian Sea, Indian Ocean.	Since 2012	Airspace Users- All participating aircraft	Optimum use of airspace , fuel saving	Capacity and efficiency	Y	FANS-1 equipped aircraft	NO	Within Indian airspace		B0-TBO	in keeping with “ best equipped best service “ Chennai and Mumbai Oceanic Control centers will accord priority to FANS I-1 aircraft logging on to Chennai/Mumbai ADS-C/CPDLC over other aircraft in allocation of preferred cruising level on ats routes UL425, M300, N571, P570 and P574.
ADS-B(OUT) services in continental airspace of India	OPS	Continental airspace of India	TBD	airspace users-all participating aircraft	Enhanced, redundant surveillance, reduced separations, flight times and increased safety	safety, efficiency, optimum use of airspace, fuel saving	Y	ADS-B equipped and certified	NO	Cooperation from airlines for equipage		BO-ASUR	India's implementation of cost of ADS-B in line with ICAO Asia Pacific Air Navigation Planning and Implementation Regional Group (APANPIRG) Conclusion 19/37 and Conclusion 21/39

4.4.4. Operational policies that are currently used

Introduction of new concepts and technologies takes time. This however can be influenced. As mentioned in the introduction, incentives are not the one and only solution. However, if incentives are applied it is to meet the challenges of timely and synchronised implementation.

The whole idea is to increase the performance of the ATM system, in the sense that the introduction of new capabilities will solve problems with capacity, cost-efficiency, safety or environmental shortcomings. Business cases should give information to what extent the proposed actions are beneficial. Proposed changes are supposed to be related to the GANP-ASBU, but some regions and states have developed their own plans to specify the activities for their situation. Often a package of measures is important, not restricted to one module, and also the scale at which it will be implemented is an important aspect. Depending on the situation, co-operation between several states and industry can be essential to achieve the benefits required.

This is a reason to ask states and stakeholders if their application of incentives is part of an overall framework for modernisation, from which it becomes clear why actions are taken. The intention is to refer to a framework, like SESAR, NextGen, or other and if no specific regional framework is developed (so far) to the GANP/ASBU.

4.4.5. Applying the Different Types of Incentives

In addition to the above-mentioned traditional forms of incentive, the transition towards full deployment may require an additional and complementary layer of regulatory impetus. Although this would not be strictly acting as an incentive, it could nevertheless provide an ultimate implementation mechanism or a backstop solution for stakeholders to proceed with deployment.

For instance, a requirement and prescribed process to introduce and certify new standards and a specific law mandate could act as levers to engage deployment amongst stakeholders, within a specific timeframe.

Furthermore, a regulatory framework or an Implementing Rule could be structured in such a way, that specific restrictions and operational dis-benefits could be generated if stakeholders do not deploy the new technologies or abide by the rules (i.e. regulatory stick, quid pro quo).

The construction of appropriate legal instruments, for instance with clear deployment deadlines / backstop dates can induce stakeholders to invest in time and in a co-ordinated, synchronised manner.

Not going in further detail, but the role of regulatory impetus can be to:

- define what should be implemented, in case stakeholders want to implement new elements, so that incentives are related to that,
- set conditions on the applications of incentives (for whom, when, how to apply)

- limit the period of transition or the period in which incentives will be provided and/or stabilise the future situation after the incentives have done their work (for instance if 80% of the airspace users is capable, what to do with the other 20%).

In a situation where several States and Air Navigation Service Providers are involved, the application of incentives, in particular operational incentives may be embedded in regional cooperation and agreements to achieve the desired results.

It is widely understood that benefits associated with air navigation modernization can produce both local and international benefits. In certain circumstances, it may be necessary for the State to provide financial and/or operational incentives to accelerate the development and deployment process towards realization of these system-wide benefits. Success of many of the key ASBU upgrades depends on a joint and synchronized investment by service providers and the users.

When designing an incentive scheme to encourage early adoption, it must be recognized that these schemes may affect users in an uneven manner; some schemes may benefit all users; others may temporarily advantage a few. In other circumstances, an incentive scheme may, in the short-run, even reduce system-wide efficiency, but ultimately accelerate implementation. When choosing an incentive scheme, States need to take into account the full consequences of their affects and weight these affects against the State's objectives. In 2013, the U.S. Federal Aviation Administration published a report titled "Operational Incentives" which provides a framework to consider such trade-offs and is reflected in the section below on operational incentives.

Working with incentives is often related to the implementation phase of new capabilities and technical systems. The provision of incentives can (preferably) even start in the research and development phases in order to attract the active participation of operational actors in the validation of the future functionalities. This participation is essential and may have a significant cost on top of normal operations; incentives are therefore a means to compensate/reward. This is an instrument being used in large modernisation programmes such as in the SESAR PPP, where public and private funding/financing coexists.

4.5. Impact of incentives

4.5.1. Evaluation, to the extent possible, of the effectiveness of the afore-mentioned items in the ToR of the MDWG regarding working with incentives

In the previous chapter considerations have been given when working with incentives and an overview has been made (table) of practices. In this chapter this information is evaluated, as requested in the ToR of the MDWG:

- Requirements applied when working with incentives
- Focus on relevance for the future implementation of the GANP/ASBU

The practices presented show that there is a wide variety in it. To make incentives work either clear arrangements between parties are needed or (and sometimes and) legal requirements to

assure cooperation and to have some clear deadlines. When commitment is not strong enough there is a risk of lower level of implementation in the period foreseen. The (future) financial incentives related to programmes like SESAR and NextGen set conditions for the application of incentives, not only to make the application of incentives transparent and without discrimination (amongst other requirements), but also to get more guarantees that the instrument will do what it should do.

4.6. Implementation of incentives

4.6.1. Existing ICAO policy on charges

In paragraph 4 the relevance of working with incentives has been highlighted, including an overview of "best practices" gathered so far. In paragraph 5 these practices have been evaluated. In this paragraph 6 more attention is paid to implement working with incentives and the relationship between some of the incentive schemes mentioned above and ICAO's current policies on charges.

In particular, ICAO's Policies on Charges for Airport and Air Navigation Services (Doc. 9082) along with Air Navigation Service Economics Manual (Doc 9161), provides an appropriate framework on the use of incentives, especially differential and modulated charges within a cost recovery regime. The primary intent of ICAO's guidance in this area is to assist States in developing a cost recovery approach for services consistent with four key principles: Charges should 1) be cost based, 2) be non-discriminatory, 3) be transparent, and 4) not cross subsidize users. With respect to differential and modulated charges, this guidance also notes that they should be time limited to ensure that the above principles are observed.

While the material contained in documents 9082 and 9161 does not explicitly address the issue of encouraging the early adoption of ASBU technologies, a number of the ideas, especially the principles of non-discrimination, transparency, no cross subsidization, and time limitation contained in these documents are applicable and may form the basis of a new incentives manual as envisioned by the ICAO Secretariat.

Just as there is no "one-size-fits" approach to implementing ASBU modules, there is no single type of incentive. Incentives can take a variety of forms. For instance, a financial incentive could take the form of a grant program in which a State pays a user to adopt certain technologies. An operational incentive could be as simple as a service provider demonstrating an operational benefit associated with the adoption of a new technology or procedure. Regardless of the form of the incentives, it is important to ensure that they are consistent with ICAO's Policies on Charges.

In broad terms, it is useful to provide a framework as to what constitutes an operational and financial incentive.

4.6.2. Key principles of working with incentives

The development and implementation of appropriate incentives should be driven by the following key principles:

- effectiveness (e.g. likelihood of success)
- intended effect (e.g. improved use of an RNP route in a defined area)
- transparency (e.g. simple and observable incentive mechanism)
- non-discrimination (e.g. national/regional vs. non-national/regional airlines)
- no cross-subsidisation (e.g. amongst stakeholders)
- time specificity (e.g. incentive in effect until 60% of operators demonstrate the required capability and/or within 2 years)

Incentives should address specific issues and target particular stakeholders with clear needs. For instance, certain stakeholders may be more concerned with Cost Efficiency, Punctuality or Predictability KPAs and therefore an incentive contributing to a performance improvement in these areas would provide valued benefits and could turn around a CBA. A process for the identification and management of risks of concern to both parties should be considered up-front and closely monitored throughout the incentive execution phase.

Incentives need to also be transparent, non-complex and easily observable, ensuring clear awareness of stakeholders about the mechanics of the incentivisation method and the benefits that could be realised as a result.

Non-discrimination is important, particularly in instances where potential grey areas could be faced in the context of state aid, competition (including WTO considerations) and in the context of geographic and legal applicability. Operational incentives would be another case, where Key Performance Areas such as for instance Access and Equity would need to be carefully considered.

Examples of specific considerations that may need to be addressed to ensure non-discriminatory practices include:

- prevent targeted state aid towards one company or national air carrier
- ensure market shares are not disturbed by specific incentives
- allow access to an incentive mechanism beyond national or regional boundaries
- provide uniform terms for financial support to stakeholders regardless of their individual credit strength
- maintain operational continuity and fair service provision
- minimise risk of (regional) retaliation as a result of incentive mechanisms in place

Linked to the previous point on competition, cross-subsidisation and fairness issues should also be considered, for instance in the context of a modulated charging regime.

Finally, in order to maximise the effectiveness of incentives, these should be considered for implementation within specific operational goals and well-defined scope (including a scope of

when incentives would be in effect, if those incentives have a temporal component). This scope and specific operational expectations help to realise objectives for transparency and provide an additional certainty of risks and benefits for investing stakeholders.

4.6.3. Impact of Incentives

The deployment challenge (see chapter 4.2) can be tackled with an appropriate package of incentives (financial, operational and regulatory), which together can have a significant effect on delivering successful deployment.

The impact that incentives can have on the deployment phase is both substantial and direct, as well as both monetary and non-monetary – both on the cost/investment side and also on the benefit/performance side.

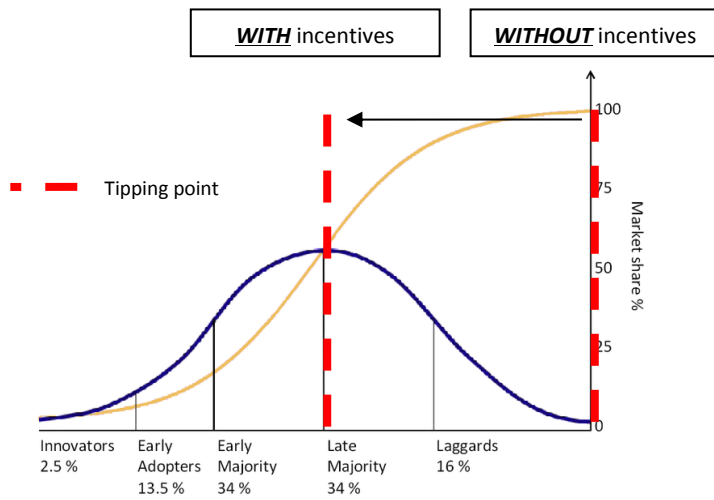
Not only can they induce stakeholders to deploy in a timely, cost-efficient and synchronised/co-ordinated manner, but they can also help maximise and appropriately apportion the performance benefits to all stakeholders and the network as a whole. For instance, benefits from direct routes or time-related savings generated at network level could be apportioned, monetised and capitalised in a more balanced way across all stakeholders (e.g. between Air-space Users, ANSPs, Airports).

Analysis of the performance value chain by means of performance influence diagrams and models helps to determine which incentives to apply where targeting exactly those key performance drivers and indicators that contribute best to the deployment objectives. The specificity of introducing such detailed incentives at a lower level across various “pockets” of performance could potentially generate a higher impact than at a consolidated level focusing only at a key performance area as a whole (i.e. impact from sum of the parts could be greater than at the consolidated level). For instance, in the case of Cost Efficiency KPA, it may be more effective to develop and place incentives on the underlying influence factors, such as ATCO productivity and technology cost savings, rather than at the aggregated Cost Efficiency KPA level.

Another key deployment challenge that can be addressed effectively with incentives is that of the time lag with which benefits for new air traffic system improvements generally arise. As explained this is mainly due to the fact that the benefits depend on sufficient equipage rates as well as coordination and synchronisation of airborne and ground investments. This links to the issue of the last mover advantage – i.e. stakeholders who wait to invest in certain capabilities until a critical mass is reached. The critical mass is the tipping point within the typical technology adoption curve, as shown in the figure 1 below, where sufficient actors have adopted an innovation in order that the continued adoption of the innovation becomes self-sustaining), This presents a substantial risk to the deployment of the ASBUs.

Figure 1 shows the typical technology adoption curve, with the blue curve representing the investments and the yellow curve the benefits. It shows how early investors are penalised compared to other who decide to wait until the critical mass of 50% is achieved and their investments immediately generate benefits. A decision to incentivise the deployment of that critical mass moves both curves to the left, achieving the tipping point sooner. Once critical mass has been achieved for a particular capability, incentives may no longer be necessary.

Fig. 1: Typical technology adoption lifecycle and suggested tipping point



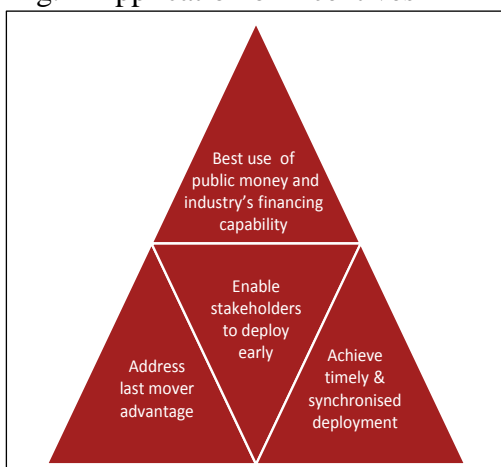
Source: Everett Rogers, *Diffusion of Innovations (5th edition)*, WGI analysis

At this stage, the notion of tipping point in the chart (fig. 1) remains at a rather theoretical / high level and depicts the point, after which there is enough critical mass for the system to move on its own to the next capability level (self-sustaining deployment). In practice, this could be determined for instance by linking incentives with a specific equipage target (e.g. 60% of aircraft equipped) and/or a specific moment in time (e.g. 2 years). As a result, although incentives would constitute a transitory arrangement, they would be critical in kick-starting deployment, bearing an overall accelerating effect on moving forward with the innovation cycle, in this case with ASBU implementation.

Fig. 2: Application of incentives

In order to maximise the impact of and develop appropriate incentives, the following key objectives should be considered at the level where incentives are being developed:

Fig. 2 Application of incentives



- achieve best use of public money;
- address the last-mover advantage issue;
- accelerate the deployment of new improvements beyond the rate achievable with no incentives .
- demonstrate benefit from new capabilities as soon as possible

Each of these overarching objectives encompasses several important aspects of deployment.

Achieving best use of public money has several facets. Attaining maximum impact of public funding at regional/national level; ensuring appropriate return on public funds; attracting addi-

tional private financing on top of public funds and thus generating sufficient gearing; such aspects fall into one dimension. In addition to this, public funding support presents a visible commitment on the part of the national/regional public authorities to proceed with timely and synchronised deployment, tackling any specific issues in the process.

Resolving the last-mover advantage issue is critical towards ensuring buy-in for a planned deployment of new capabilities across stakeholder groups. Demonstration of quickly achievable benefit, whether achieved through incentive, or the initial implementation of a new capability on a small scale, can help to accelerate the adoption of new technologies and procedures.

At the regional level, addressing the last-mover advantage issue could be linked to investment conditionality, formal arrangements and agreements, such that one stakeholder group or State can proceed with investments, knowing that the other “counter-party” will also proceed. Such arrangements could take several forms, including bilateral/multilateral agreements, letters of intent/agreement or regional coordination mechanisms, possibly under the umbrella of ICAO. If on top of this there are sufficient incentives to invest quickly for any stakeholder, not only would this result in avoiding a particular stakeholder to wait being the last investor, but it would in fact induce them to invest first and indeed as soon as possible (creating a form of competition).

All of this leads to the final point on achieving a timely, co-ordinated and synchronised deployment across all stakeholders. Achieving early equipage and critical mass, across all stakeholder groups can induce substantial performance benefits as soon as possible, maximising return on investment for deploying stakeholders.

4.6.4. Methods of incentivisation

A combination of incentive methods, applied at different levels would be appropriate.

The starting point is the operational change/goal to be achieved and the issues that implementation would raise in the absence of incentives. In this sense, a holistic and critical view should be adopted when applying incentives, for instance not for each ASBU module separately or in isolation, nor for the full-blown overall implementation of all modules by all stakeholders across all geographic areas. The deployment challenge or “problem” should be broken down to more manageable yet sufficiently aggregated elements, upon which targeted incentives could have a greater effect.

Different methods could be developed to provide incentives towards specific stakeholder groups, for instance facing a negative CBA or prohibitively long paybacks and/or low returns of investment.

Incentives could focus on targeted locations or geographic areas, at very high capacity or very high complexity hotspots.

In particular, incentives could be constructed as a “wrapper” to specific deployment packages of ASBU elements. In such cases, incentives would indeed not be targeting full implementation of all modules, but specific bundles or packs of investment. As alluded before, it is potentially most efficient to consider incentives at an appropriate “middle level” of deployment aggregation, neither on the one hand for full ASBU deployment, nor on the other hand for each module on a standalone basis. This would also ensure the maximisation of the collabora-

tion/co-ordination/synchronisation effect amongst several stakeholders, deploying several ASBU elements together.

Indeed, an incentivisation method with potentially significant effects (e.g. promoting co-ordinated/synchronised investments) could be the introduction of collective and co-ordinated incentives across multiple stakeholders. This could entail an element of conditionality, for instance closely securing/guaranteeing that airline incentives would only be available/accessible and dependent on a joint deployment programme to be executed in tandem with ground stakeholders.

One variant of this could be formal or legally binding contractual arrangements amongst stakeholders, which could then be embedded into an overall financial support contract. This could indeed facilitate the creation of joint deployment projects, or common projects.

Going one step further to promote stakeholder collaboration and ensure a co-ordinated and synchronised approach towards deployment, this idea could be developed via the setup of collaborative arrangements consortia formed by individual companies / organisations. The purpose of each would be to execute the joint deployment project.

The obligations of the consortium in turn could typically be to:

- carry out the activities in accordance with the consortium's joint deployment project plan;
- agree to be bound by standard project management terms and conditions;
- ensure overall progress reporting and perform the overall administration of the activities;
- inform the relevant deployment governance function of any significant information, risk, fact, problem or delay likely to affect the performance of the joint deployment project; and
- provide to the deployment governance function all information requested in the framework of controls and audits in relation to the performance of the financial support contract.

The obligations of the stakeholders forming the consortium would typically be to carry out the activities jointly and severally vis-à-vis the relevant deployment governance function, taking all necessary and reasonable measures to ensure that the activities are carried out in accordance with the terms and conditions of the financial support contract and make appropriate internal arrangements consistent with the provisions of the financial support contract to ensure the efficient execution of the joint deployment project.

A mix of incentivisation methods can be used in a complementary manner. As a matter of fact, in order to de-risk the possible success of a deployment programme, parallel incentivisation methods may be preferential than a strictly sequential or "wait & see" approach. For instance, introducing Operational Incentives in isolation, to assess also whether additional financial incentives would be required, may not be optimal. On the other hand, financial incentives could potentially be considered as the very first step to induce immediate investment; followed by operational incentives, which could be accessed and executed once some financially incentivised equipage has already taken place and a critical mass achieved; to be followed eventually by backstop regulatory instruments/mandates with hard deadlines for implementation.

However, it is not always necessary to implement a full suite/catalogue of incentives and this would depend on a case-by-case basis. Although a combination of incentives could have

greater and more immediate effects, on the other hand over-incentivisation would not be prudent. This could lead to an inefficient use of resources (e.g. financial) and a sub-optimal deployment progress. An example could be the case of front-loading all or most incentives upfront, instead of introducing more gradual incentives throughout the whole deployment sequence.

Under certain circumstances, in specific regions, certain incentive mechanisms may be more appropriate than others (e.g. where cross-stakeholder synchronisation is less of an issue or where operational efficiency is not best-in-class). As mentioned before, these considerations would really depend on a case-by-case basis: one solution does not fit all and an intelligent use of the most appropriate incentives from the whole incentivisation toolset should be targeted.

Although historical deployment examples in aviation and ATM could provide some useful insights, because each case is different, drawing conclusions for shared or best practices which could be applied in all circumstances and being prescriptive would be perilous. Nevertheless, below are a few lessons learnt from past experiences, which should be taken into consideration when constructing appropriate incentives:

- insufficient public co-funding rates;
- unclear co-ordination mechanisms between airborne and ground stakeholders;
- loose regulatory instruments / Implementing Rules;
- lacking commitment and appetite to renege amongst stakeholders / States;
- local implementation issues not considered;
- deficient communication and implementation of incentive mechanisms;

It should be noted, once again, that financial incentives are only one, although an important component of the underpinning for ASBU deployment, which will also be driven by individual stakeholder business cases, operational incentives, as well as regulatory and governance considerations.

4.6.5. Link between incentives and Business Cases / Cost Benefit Analyses

There is a very close link between incentives and individual stakeholder Business Cases / CBAs.

At a first level, the construction of incentives might be necessary to address stakeholders facing negative Business Cases / CBAs, low returns on investment and/or prohibitively long payback periods. It is also possible that being able to provide demonstrable benefit from a new advancement would change a business case sufficiently for an incentive to become unnecessary. Investment decisions could be taken by each stakeholder independently (e.g. at company level), separately but also on a collective basis, for instance at a national/regional level.

The development of incentives should consider the results of stakeholder Business Cases / CBAs. CBA analyses are helpful in determining the amount of investments and any financing gaps, which would determine the size of the potential funding or operational benefit necessary to make the incentive effective.

During a next iteration the Business Cases and CBAs are further refined by including the incentive assumptions in the analysis. This will demonstrate the impact of the incentives on the NPV and ROI.

This could be illustrated with the following example:

New investments => CBA: costs and benefits analysed => Incentives (if CBA not favourable)
=> CBA refined

More specifically, this iteration process should be an integral part of the overall planning of the ATM system. The needs for additional performance trigger the identification/consideration of the potential solutions. For each suitable solution element/ operational change under consideration and retained in a draft implementation plan, an assessment is made including CBA before a deployment proposal is established. This analysis will identify any shortfall (e.g. in realising performance benefits); propose an incentive to meet it; and then conduct further CBA analysis on the basis that the incentive has been effective in reaching the intended goal.

As a result, through several iterations of the Business Cases / CBAs and the development of incentives it is possible to optimise the use of the incentives and maximise the results of the Business Cases / CBAs before finally the deployment decision is made.

4.6.6. Incentives and Financial Instruments

Although the use of incentives and certain financial instruments could facilitate and accelerate deployment, no specific incentivisation mechanism is being prescribed in this document. States and/or regions would retain the flexibility to devise appropriate incentive schemes, which would contribute to the realisation of the overall objective, to achieve a timely and synchronised deployment amongst stakeholders and regions.

In the area of financial incentives, several instruments could be used to maximise financial impact and induce timely and co-ordinated/synchronised deployment.

For instance, public funding instruments could take the form of direct grants or subsidies, to facilitate both ground and airborne investments. Public funding support could also be provided via credit guarantees at national or regional level, to enhance existing private financing channels (e.g. improving credit ratings and lowering repayment risk).

In the case of a dedicated public-private financial mechanism to provide financial support to one or more stakeholder groups (e.g. providing financial support to airlines for early airborne equipage), public sector equity could also be envisaged. Several instruments could in turn be used by such a mechanism to maximise impact and security of repayment, for instance loans with preferential terms, levies, direct procurement, leases, etc.

Another potential tool could be charging modulation and the use of a differentiated route charge unit rate. For instance, this could provide the possibility for a higher unit rate to be charged by ANSPs that have invested in specific capabilities. Likewise, Airspace Users could be incentivised via a more favourable route charge in the case of enhanced aircraft equipage

and potentially penalised with a higher charge if they are operating aircraft/flights with a lower capability level. In this case, a new concept of operations with the use of capability segregated airspace could be envisaged.

Finally, an indirect financial incentive tool could be the possibility of co-funding pre-deployment activities, such as for R&D, Validation activities and Large Scale Demonstrations.

Non-financial tools and regulatory aspects can be explored to complement the introduction and effectiveness of financial incentivisation instruments, as elaborated in the section on overall incentive implementation.

What is highly relevant for WG1, but also for WG2 and WG3 is that when considering working with incentives, it should be part of a more generic vision and policy about financial instruments and the relations with business cases. In most cases the "traditional" investments from stakeholders remain essential to implement the ASBU. In addition, it should be mentioned that this vision about financial instruments should be linked to a vision about priorities for implementing specific modules, as resources are not infinite.

TBD: if this paragraph is relevant here:

4.6.7. Identification of the stakeholders impacted by the ASBUs implementation and the geographic level in the implementation

- Attention to be paid to:
 - Air – ground
 - ANSPs: civil, civil-military
 - Role of government authorities
 - Assessment

4.6.8. Consider the aspects of equipage, training, certification and operational approval, etc.

The GANP includes also aspects like equipage training, certification and operational approval. These elements have to be taken into account for implementation. As these aspects require resources these influence the readiness and timing of implementation. When developing a plan for implementation these elements should be included, as far as applicable. Incentives can also be applied for these aspects.

4.7. Conclusions

a. Need for incentives

The overall objective being the implementation of the GANP/ ASBU, incentives are a means to induce the relevant stakeholders to invest in time in a co-ordinated, synchronised manner:

- to commit resource on the desired roadmap.
- to encourage early action to create the critical mass.

Although most of the examples given relate to issues from an earlier period of the implementation of the ASBU (which is inevitable, as the whole idea is to support implementation of the

ASBU and if this was already done, there was no need for this document), they show that there is a need to work with incentives and that it has results.

b. Type of incentives

Both operational and financial incentives have their own merits and it will depend on the situation which one to apply or both. It can also be needed to put the incentives in a legal framework (see next point), for clear deadlines and conditions.

c. Incentives to be applied within a certain context

When working with incentives, it should be done within a certain context, to be sure for what purpose the incentives will be used and under which conditions. This requires:

- i. Strategy and plan about why and how to work with incentives
- ii. Objectives about what to achieve with incentives, in particular what performance should be improved
- iii. Incentives as part of a set of potential instruments, like business cases and CBA and the relation with potential other financial instruments. This has to be clarified in advance.
- iv. Criteria for the application of incentives, like effectiveness, intended effect, transparency, non-discrimination, no cross-subsidisation, time specificity. Also the geographical scope and duration should be defined in advance
- v. Application of ICAO material, as far as applicable and available. For instance existing policy material for route charges already allows working with incentives, but some words can be added to make clear that for implementation of the ASBU incentives are not an exceptional tool.

d. ASBU implementation will become more obvious in the coming years, and may lead to an update of the guidance material.

4.8. Recommendations

To avoid last user investments, delaying the modernisation of ATM, or even preventing a good implementation, incentives should be taken into consideration. The nature and scale of incentives differs per subject.

Working with incentives should be embedded in a plan to implement (modules of) the ASBU. Add value should be clear, based on business cases, to see what the added value is of working with an incentive.

The material from this chapter should therefore be used in combination with the material described in the previous chapters on business cases and CBA and financial instrument. The criteria for working with incentives should be clear and transparent and therefore documented.

Appendix 1: More information on Cases in the European Environment

1. Introduction

This note provides information in the context of best practices at policy level. Best or good practices should deliver information valuable to support the implementation of the ASBU. In Europe experiences exist with the development and implementation (Deployment) of SESAR. The framework for SESAR is the European ATM Master Plan that is aligned with the ASBU.

Although the European experience is related to the specific circumstances, still several experiences can be shared that address generic issues, as improving the ATM system in a multi-state environment, with several Air Navigation Service Providers, airlines, airports and other industrial parties. Also the issue of stimulation and organising cooperation and achieving commitment are addressed. Europe has the unique system of having created a legally binding regional structure, but this is based on good cooperation between many partners involved and based on commitment to improve ATM. This cooperation and commitment are conditions that will contribute to a successful implementation at other places in the world as well, as even without such a legal system the notions and principles behind it are relevant for other states and regions. Therefore the information provided is hopefully interesting for others as well.

2. Cases

The following cases are from the EU policy on the Single European Sky (SES). SESAR is the technological pillar of the SES. SES is a policy, supported by regulation and operational arrangements to improve a better performance of the capacity, efficiency, safety and environmental benefits of the ATM system in Europe. The 28 EU member States mandated the EU to develop SES policy and regulation. The European Commission is the executive body of the EU with the exclusive right to propose EU regulation. EU regulation, once approved, is binding for the EU member States. SES is not only applied for the 28 EU member States, but also to several other European States with agreements with the EU to apply the Single European Sky (SES) policy in their State.

Cases described here are:

- a. Route charges, and the potential application of incentives;
- b. Performance regulation, as a framework to address and support the improvement of the performance of the ATM system, to which the deployment of SESAR has to contribute;
- c. SESAR Deployment.

CASE A: Route charges applied in the European Union

Introduction

Europe is applying route charges, based on the ICAO principles. The European Union is mandated by its States to develop the Single European Sky policy, including a set of regulations that are mandatory for the States to implement. The route charges are based on European Commission Regulation (EU) No 391/2013 of 3 May 2013 laying down a common charging scheme for air navigation services; in combination with European Commission Regulation (EU) No 1191/2010 of 16 December 2010 amending Regulation (EC) No 1794/2006 laying down a common charging scheme for air navigation services. This regulation is mandatory for EU Member States. The notion of incentives is incorporated in this regulation. The intention of this appendix is not to promote this regulation, but to illustrate a way of working with incentives. The text below is simply offered as food for thoughts about incentives to indicate which conditions may be applied when working with incentives; it does not reflect the full regulation.

Conditions for incentives

States, at national or Functional Airspace Block level, may, on a *non-discriminatory* and *transparent* basis, establish or approve incentive schemes to support improvements in the provision of air navigation services or the reduction of the environmental impact of aviation (*this relates to the KPAs applied in the performance scheme in Europe, based on the KPAs of ICAO, but simplified*).

Those incentives may apply to *air navigation service providers* or *airspace users*.

States, at national or functional airspace block level, may adopt financial incentives for the *achievement of performance targets* by their air navigation service providers. This means, the can apply an incentive scheme with respect to users of air navigation services in order to:

- a) optimise the use of air navigation services;
- b) reduce the environmental impact of flying;
- c) reduce the overall costs of air navigation services and increase their efficiency, in particular by decreasing or modulating charges according to airborne equipment that increases capacity or offsetting the inconvenience of choosing less congested routings;
- d) accelerate the deployment of SESAR ATM capabilities.

States shall *monitor* the proper implementation by air navigation service providers of these incentive schemes.

The regulation sets conditions on working with financial incentives. A selection has been made here, for issues interesting for other States and regions considering working with incentives:

The purpose of applying an incentive can be:

- cost reductions to the benefit of users.
- encourage better performance regarding to the desirability of rewarding or penalising actual performance in relation to performance levels expected

- accelerate the implementation of SESAR technologies, investments in new ATM systems and major overhaul of existing ATM systems (this can be compared with the implementation of the ASBU of ICAO), which have an influence on the level of performance of the European ATM network.

In this specific case are involved,:

- States and their ANSPs
- The level of charges imposed in particular on light aircraft should not discourage the use of facilities and services necessary for safety or the introduction of new techniques and procedures.

There is a need to get cooperation/collaboration of parties involved, and if possible. This requires user consultation, transparency of cost made by the Air Navigation Service Providers.

The Geographical scope in this case is:

- EU member States and other states implementing the Single European Sky.
- The provisions in the regulation apply to States or group of States, like in Functional Airspace Blocks

The intent is a contribution to a better performance of the aviation system, and it should be specified what type of performance improvement is sought and how is this monitored:

- The charging regulation is directly linked to the (EU) performance regulation, to contribute to a better performance of the ATM system (see Case B).

The criteria used to apply the incentives:

- Member States shall adopt financial incentives for their air navigation service providers in the key performance area of capacity and may adopt such financial incentives in the key performance area of environment.
- Such financial incentive schemes shall conform to the following principles:
 - The applicable level of bonuses and penalties shall be commensurate with the targets to be reached and the performance achieved. There shall be no bonuses for performance that is at or below that expected in performance targets;
 - The applicable level of bonuses and penalties shall be equal;
 - the maximum amount of aggregate bonuses and the maximum amount of aggregate penalties shall not exceed 1 % of the revenue from air navigation services in year n;
 - the performance variation levels and the applicable level of bonuses and penalties shall be determined following the consultation and shall be set by the performance plan;
 - in case of targets at the level of functional airspace blocks, bonuses and penalties shall be applied to the air navigation service providers concerned;
- National supervisory authorities shall monitor the proper implementation of these incentive schemes by air navigation service providers.
- Member States, following the offer to consult may, at national or functional airspace block level, and on a non-discriminatory and transparent basis, modulate air navigation charges incurred by airspace users to reflect their efforts made in particular to:
 - optimise the use of air navigation services;

- reduce the environmental impact of flying;
- reduce the overall costs of air navigation services and increase their efficiency;
- The modulation of charges shall not result in any overall change in revenue for the air navigation service provider. Over- or under recoveries shall be passed on to the following period.
- Air navigation charges may also be modulated, on a non- discriminatory and transparent basis, to accelerate the deployment of SESAR ATM capabilities (compare with ICAO ASBUs). The modulation may in particular aim at giving incentives to equip aircraft with systems included in the common projects.
- The modulation of air navigation charges means a variation of the en route charge and/or the terminal charge.
- National supervisory authorities shall monitor the proper implementation of the modulation of air navigation charges by air navigation service providers.

Incentives as part of a bigger framework of implementing/deploying new concepts and new techniques to modernise ATM and if so, how is this related to the ICAO GANP/ASBU:

- The common charging scheme should be an integral element in reaching the objectives of the performance scheme;
- the charging scheme should promote cost and operational efficiencies and should provide for the establishment of incentive schemes for air navigation service providers to support improvements in the provision of air navigation services, including the application of traffic risk sharing.
- The common charging scheme should be consistent with the EUROCONTROL Route Charges System and Article 15 of the 1944 ICAO Chicago Convention on International Civil Aviation (the ‘Chicago Convention’).

CASE B: Performance for service provision as applied in the European Union

Introduction

The EU has taken the ICAO performance approach and its KPAs to develop a performance regulation and performance scheme for the EU member States, Europe works with performance targets, to be met, but the information in this Appendix can be useful for other States and regions as well. The philosophy is that new concepts and new technologies should contribute to a better performance of the ATM system, so that in the end the results are made visible and where possible quantified. Activities cannot be introduced at random, but should be embedded in a performance plan, for which requirements are defined, Here the intention is not to promote this regulation as such, but to illustrate a way of working with incentives. The text below is simply offered as food for thoughts about incentives; it does not reflect the full regulation. To see the full text, readers should consult:

Performance Regulation Commission Regulation (EU) No 691/2010 of 29 July 2010 laying down a performance scheme for air navigation services and network functions and amending Regulation (EC) No 2096/2005 laying down common requirements for the provision of air navigation services. This regulation is mandatory for EU Member States.

Conditions

- The performance plans should describe the measures, such as incentives schemes, aimed at driving the behaviour of stakeholders towards improving performance at national, functional airspace block and European levels.
- The implementation of binding performance targets supported by incentives that can be of financial nature requires appropriate link with the common charging scheme for air navigation services.
- The performance plans shall contain, in particular:
 - performance targets in each relevant key performance area, set by reference to each key performance indicator, for the entire reference period, with annual values to be used for monitoring and incentive purposes;
 - a description of the incentive mechanisms to be applied on the various accountable entities to encourage achievement of the targets over the reference period;
- The incentive schemes applied by Member States as part of their performance plan, shall comply with the following general principles:
 - a. they shall be effective, proportional, and credible and shall not be changed during the reference period;
 - b. they shall be implemented on a non-discriminatory and transparent basis to support improvements in the performance of service provision;
 - c. they shall be part of the regulatory environment known ex ante by all stakeholders and be applicable during the entire reference period;
 - d. they shall drive behaviour of entities subject to target setting with a view to achieving a high level of performance and meeting the associated targets.
- Incentives on safety targets shall aim at encouraging that required safety objectives are fully achieved and maintained while allowing for performance improvements in other key performance areas. They shall not be of financial nature and shall consist in action plans with deadlines and/or associated measures
- Incentives on cost-efficiency targets shall be of financial nature and shall be governed by appropriate provisions. They shall consist in a risk-sharing mechanism, at national or functional airspace block level.

- Incentives on capacity targets may be of financial nature or of other nature, such as corrective action plans with deadlines and associated measures, which may include bonuses and penalties, adopted by Member States.
- Incentives on environment targets shall aim at encouraging the achievement of required environmental performance levels while allowing for performance improvements in other key performance areas. They shall be of financial or non-financial nature and shall be decided by Member States taking account of local circumstances.
- Member States, at national or functional airspace block level, may establish or approve incentives schemes on airspace users,

Description of best practices

1. The purpose of applying an incentive (and why it was decided to use incentives)
 - Improve the performance by modernising the ATM system and to stimulate common projects, to get more participants, and reward early investors.
2. Who are involved in this specific case, and if needed specify categories (like airspace users)
 - Regulation regards States. The parties involved are States, ANSPs and airlines.
3. Need to get cooperation/collaboration of parties involved, and if possible, describe the responsibilities of these parties
4. Geographical scope
 - State, FAB level and Network Management level.
5. Contribution to a better performance of the aviation system, and what type of performance improvement is sought (capacity, efficiency, safety, environment), and how is this monitored.
 - For the time being priority is given to capacity and efficiency.
6. Type of incentive applied (and specify):
 - See previous paragraph
7. What criteria are used to apply the incentives and was there a special policy or regulatory decision needed to apply the incentives
8. Incentives as part of a bigger framework of implementing/deploying new concepts and new techniques to modernise ATM and if so, how is this related to the ICAO GANP/ASBU
 - Used to define major principles when working on Common Projects (Case C) and applying incentives, as all this work should be justified by improving the performance of the ATM system.

CASE C: SESAR Deployment as proposed in the European Union

Introduction

The renewal of the ATM system in the European States, member of the EU, is part of the SESAR programme. This has 3 phases: definition, development and deployment. Although development is still going on, the time has come for implementation (the term "deployment" is used in Europe, including all kind of activities needed for implementation). For the deployment financial instruments are developed, including the possibility to work with incentives, under strict conditions (as referred to before in Case A and B). Another element is that government is required for a proper implementation, as in Europe for most projects (comparable with the ICAO ASBU) several States and Air Navigation Service Providers are and should be involved to get the best contribution to a better performance, but also to reach economies of scale. This should fall within a framework, the European ATM Master Plan that is aligned with the ICAO ASBU. As this work cannot be done at random, regulation has been developed.

The purpose of this case is to provide information to other regions and States, that can inspire them when developing their own implementation plans,

Formal reference is the European Commission implementing regulation (EU) No 409/2013 of 3 May 2013 on the definition of common projects, the establishment of governance and the identification of incentives supporting the implementation of the European Air Traffic Management Master Plan. Here the intention is not to promote this regulation, but to illustrate a way of working with incentives. The text below is simply offered as food for thoughts about incentives; it does not reflect the full regulation.

Conditions for working with common projects and the support by incentives

Incentive mechanisms for the deployment of SESAR (Single European Sky Air Traffic Management Research and development) include common projects, which should assist the successful implementation of the European ATM Master Plan. Guidance is provided on common projects, which should establish a binding framework on how common projects can support the implementation of the ATM Master Plan. Governance mechanisms are required which should ensure timely, coordinated and synchronised deployment by setting out a clear allocation of responsibilities amongst stakeholders.

Incentives are to help airspace users and air navigation service providers to improve collective air navigation infrastructure, the provision of air navigation services and the use of airspace by working together in common projects. The aim is also to speed up the deployment of the SESAR project.

The projects should refer to the European Air Traffic Management (ATM) Master Plan, as the agreed roadmap to bring ATM research and development to the deployment phase.

A timely, coordinated and synchronised deployment of SESAR is essential to achieve the SES performance objectives and the overall economic benefits expected from ATM modernisation.

Common projects should help boost the performance of the European ATM network (EATMN) and demonstrate overall positive cost-benefit analysis, mindful of any potential negative impacts for specific regions or stakeholders.

In order to ensure that common projects are implemented and monitored in a timely, coordinated and synchronised manner, making optimal use of the instruments and bodies identified in the single European sky regulatory framework, a governance of SESAR deployment should be established. In order to govern SESAR deployment effectively and ensure credibility of the deployment process, the operational stakeholders accountable for the performance of the ATM system should be involved in deployment governance.

Operational stakeholders investing in SESAR deployment should play a leading role in managing and implementing deployment activities, preferably through a single entity, while avoiding any conflict of interest.

The European Commission should oversee deployment activities making sure they follow the SES objectives and safeguard the public interest, by establishing appropriate reporting and monitoring mechanisms making the best use of existing instruments such as the European and Local Single Sky Implementation (ESSIP Plan and Report and LSSIP documents).

Common projects shall aim to deploy in a timely, coordinated and synchronised way ATM functionalities that will achieve the essential operational changes. Common projects shall be consistent with and contribute to the European Union-wide performance targets. Common projects shall identify the ATM functionalities that:

- a. having reached the appropriate level of industrialisation, are mature for implementation;
- b. require synchronised deployment.

The maturity of ATM functionalities shall be demonstrated, inter alia, on the basis of the results of validation carried out by the SESAR Joint Undertaking, the status of standardisation and certification processes and an assessment of their interoperability, also in relation to the ICAO Global Air Navigation Plan and relevant ICAO material.

The need for synchronised deployment of ATM functionalities shall be assessed on the basis of:

- a definition of their geographical scope and planning, including deployment target dates;
- an identification of the operational stakeholders required to deploy them;
- transitional measures for their progressive deployment.

Common projects shall also:

- demonstrate a positive business case for the EATMN, based on an independent cost-benefit analysis, and identify any potential local or regional negative impact for any specific category of operational stakeholders;
- identify incentives for deployment, in particular to mitigate negative impacts on a specific geographical area or category of operational stakeholders;

- identify any need for new implementing rules for interoperability and safety, Community specifications and civil standards to support their deployment and their applicability to the military taking into consideration civil and military systems' equivalence; and
- take account of the relevant deployment elements specified in the Network Strategy Plan and the Network Operations Plan of the Network Manager.

The deployment programme shall:

- provide a comprehensive and structured work plan of all activities necessary to implement technologies, procedures and best practices required to implement common projects. It shall organise these activities in implementation projects identifying the associated risks and mitigation actions, the geographical scope, the timeframe and the operational stakeholders responsible for carrying out the implementation projects.
- constitute the reference for the work of the Management and Implementation levels.
- be part of the framework partnership agreement and, as such, the members of the deployment manager shall commit to implement it.

Incentives may be identified when establishing common projects. Incentives can be broken down into two main categories:

- European Union funding, focusing on the implementation projects (Level 3 of SESAR deployment governance). This funding may be allocated to air navigation service providers and/or airspace users, on a non-discriminatory basis.
- Incentives in relation with the performance and charging Regulations, which contain two main sub categories:
 - Incentives on air navigation service providers consisting in bonuses – penalties for reaching / not reaching performance targets in particular in the capacity / delay key performance area. This category is not perceived as relevant for common projects.
 - Incentives on airspace users in the form of ANS charges modulation are possible to optimise the use of air navigation services, reduce the environmental impact of flying and/or encourage the use of specific routes.

Incentives should be targeted at:

- Ensuring synchronisation (including alignment of requirements) and timely deployment;
- Mitigating negative business cases either for some specific ATM Functionalities or specific stakeholders categories;
- Encouraging and securing on-time equipage of aircraft and overcoming the last mover advantage;
- Compensating possible negative cash-flow during the transition phase (long payback times) and avoiding pre-financing by airspace users.

The implementation of i4D will require synchronised modifications to both ground and airborne capabilities, in accordance with the European ATM Master Plan. In this context, the “First Come First Served” principle will not necessarily guarantee the most efficient and effective handling of mixed capabilities. As a consequence, it proposes a paradigm shift towards “Best Efficiency Best Served” (BEBS), leading to a progressive stronger focus on a "Serve by

Schedule" philosophy for main airports at which point the 4-D Business Trajectory objective can be fully realised.

More specifically a first BEBS supporting measure is proposed to be implemented for i4D which would consist in giving a preferential service to equipped aircraft (e.g. ATFCM priority). BEBS implementation should be enforced through neutral, transparent and non-discriminatory processes (i.e. in this case all aircraft that are capable will have access to the preferential service).

Appendix 2: Detailing the Operational Incentives – India

1. Creation of UPR Geographical Zone in Arabian Sea and Indian Ocean

- a. Nature: Operational
- b. Reference: AIP India Supplement 29/2013 dated 22 August 2013.
- c. Geographical area: UPR Airspace described in 2.1 of the AIP India supplement 29/2013 dated 22nd August 2013.
- d. Date(s) of application: Since October 2013
- e. Beneficiaries / populations concerned : Airspace users
- f. Conditions of application:

Only those airspace users may flight plan a user preferred route in the UPR Geographic zone which meet the following minimum criteria:

 - RNP10, and
 - ADS-C and CPDLC equipped

The minimum criteria listed above must be notified in the flight plan. The flight shall log on to Chennai ADS-C/CPDLC VOMF or Mumbai ADS-C/CPDLC VABF as appropriate, prior to entering UPR zone. UPR flights are subject to provisions applicable to IFR flights in Class E airspace.
- g. Participating ground ATM services/systems; ANSPs of India and Male
- h. Purpose (why an incentive): To reduce the environmental impact of aviation the members of the Indian Ocean and Arabian Sea Strategic Partnership to Reduce Emissions (INSPIRE) are collaborating to allow airspace users access to User Preferred Routes across the Arabian Sea, Indian and Southern Oceans and adjoining airspaces.
- i. ATM performance impact and change it makes to the ATM system; Capacity, Efficiency, Environment.
- j. Exemptions if any; description of what happens to non-compliant flights; procedures for non-nominal situations affecting flights or ground equipment: Contingency procedures are described in section 2.4 of the AIP supplement. The UPR option is available to only those flights that meet the conditions that are specified in the AIP Supplement.
- k. Necessary regulatory provisions, if any; AIP India Supplement 29/2013 dated 22 August 2013.
- l. Airborne and ground (and space) equipment/capability essential to be put in place so as to ensure benefits are generated: aircraft/fleet with RNP10 capability and operational ADS-C and CPDLC.
- m. Business case brief description of the main arguments and key figures; NIL

2. Preferred Cruising Level Allocation to suitably equipped aircraft in Mumbai and Chennai FIR :

- i. Nature: Operational
- ii. Geographical area: Arabian sea, Indian Ocean and Bay of Bengal portions of Chennai FIR and Mumbai FIR
- iii. Date(s) of application: Since 2012
- iv. Beneficiaries / populations concerned : Airspace users
- v. Conditions of application:
 - RNP10, and
 - Operational ADS-C and CPDLC equipped

The minimum criteria listed above must be notified in the flight plan. The flight shall log on to Chennai ADS-C/CPDLC VOMF or Mumbai ADS-C/CPDLC VABF as appropriate.
- vi. Participating ground ATM services/systems; ANSP of India
- vii. Purpose (why an incentive): PREFERNCE TO DATA LINK EQUIPPED AIRCRAFT IN MUMBAI AND CHENNAI OCEANIC AIRSPACE
- viii. ATM performance impact and change it makes to the ATM system; Capacity, Efficiency, Environment. REDUCTION IN SEPARATION, OPTIMUM FLIGHT LEVELS
- ix. Exemptions if any; Nil. The service is provided on request of airspace users and based on air traffic scenario.
- x. Necessary regulatory provisions, if any; NOTAM TAKEN by India in 2012. (G049/12.).

IN KEEPING WITH “ BEST EQUIPPED BEST SERVICE “ CHENNAI AND MUMBAI OCEANIC CONTROL CENTERS WILL ACCORD PRIORITY TO FANS I-1 AIRCRAFT LOGGING ON TO CHENNAI/MUMBAI ADS-C/CPDLC OVER OTHER AIRCRAFT IN ALLOCATION OF PREFERED CRUISING LEVEL ON ATS ROUTES UL425, M300, N571, P570 AND P574.

AIRCRAFT EQUIPPED WITH ADS-C/CPDLC ARE ENCOURAGED TO LOG ON TO CHENNAI/MUMBAI WHEN OPERATING ON ABOVE ATS ROUTES FOR OPTIMUM USE OF AIRSPACE IN BAY OF BENGAL AND ARABIAN SEA AREA.
- xi. Airborne and ground (and space) equipment/capability essential to be put in place so as to ensure benefits are generated: aircraft/fleet with RNP10 capability and operational ADS-C and CPDLC.
- xii. Business case brief description of the main arguments and key figures; NIL

3. Operational priority through Provision of Automatic Dependent Surveillance – Broadcast (ADS-B) Out Based ATS Surveillance Services on opportunity basis in Indian Airspace

Introduction:

Recognizing that ADS-B avionics as an enabler of the global ATM concept bringing substantial safety & capacity benefits, India supports the cost-effective early implementation of ADS-B in line with ICAO Asia Pacific Air Navigation Planning and Implementation Regional Group (APANPIRG) Conclusion 19/37 and Conclusion 21/39.

India has implemented ADS-B for the provision of Air Traffic Services, including ‘radar-like’ separation in a phased manner. The Automatic Dependent Surveillance Broadcast “(ADS-B) OUT” transmissions on 1090MHz Extended Squitter data link will be used for provision of ATS surveillance services to eligible aircraft within notified portions of Indian airspace(s).

The ADS-B Out implementation in India is aimed at providing redundancy where Radar surveillance is already available. In addition, ADS-B Out enables the expansion of Air Traffic Control (ATC) surveillance services in remote & high terrain areas, oceanic airspace and also to fill the surveillance gap over the Continental airspace

Conditions:

The provision of ATS Surveillance services using ADS-B Out information, in terminal and enroute airspace, to eligible aircraft, on an opportunity basis, is envisaged to continue until the DGCA (India) considers mandating the carriage of ADS-B Out equipment, from an appointed date.

In conformance with APANPIRG Conclusion 21/39 to mandate ADS-B through a prescribed standard format and APANPIRG Conclusion 22/8 to provide priority for access to such airspace for aircraft with operative ADS-B equipment over those aircraft not operating ADS-B equipment, ATS Surveillance Services will be provided to aircraft equipped with operative ADS-B equipment on an opportunity basis for the optimum utilization of the airspace.

Description of Best Practices:

1. The purpose of applying the Operational Priority:
 - Enhanced safety through Enhanced and redundant surveillance
 - Enhanced safety through expansion of Air Traffic Control (ATC) surveillance services to remote & high terrain areas, oceanic airspace
 - Enhanced capacity of airspace by applying Surveillance Based separation between suitably equipped aircraft
 - Reduced Delays on Ground and Reduced Holding in the air

- Fuel savings and Cost benefits to Airlines
 - Reduced Emission leading to Environmental protection
 - Encouraging other Airlines to equip themselves and reap the benefits
 - Improved Search and Rescue Services through ADS-B reports
2. Agencies Involved
 - DGCA by expediting Aircraft Equipage approval
 - Airlines by expediting ADS-B equipage
 3. Cooperation/Collaboration of Agencies.
 - Needs proactive approach from Airlines thro early ADS B equipage and from DGCA thro expeditious regulatory approval process.
 4. Geographic scope:
 - The ATS Surveillance services to be provided by an ATC Centre to ADS B equipped aircraft, within a notified volume of airspace under its control and jurisdiction, based on ADS-B surveillance information from the ADS-B ground stations certified by the regulator, shall be notified through G- Series NOTAM.
 5. Contribution to Performance improvement:
 - Overall improvement in Safety, Operational efficiency, Fuel/cost savings, Environmental protection
 6. Type of Incentive:
 - Operational incentive through Provision of Priority for access to airspace and for ATS Surveillance Services to aircraft equipped with operative ADS-B equipment
 7. Criteria and used to apply incentives and the need for Regulatory decision:
 - Operational priority for aircraft equipped with ADS B with focus on Safety, Operational efficiency, Fuel/cost savings, Environmental protection
 - Regulatory mandate for early equipage of aircraft with ADS B
 8. Linkage of the Priority in line with ICAO decision
 - India's implementation of cost of ADS-B in line with ICAO Asia Pacific Air Navigation Planning and Implementation Regional Group (APANPIRG) Conclusion 19/37 and Conclusion 21/39.

Annex 1: TERMS OF REFERENCE OF THE MULTI-DISCIPLINARY WORKING GROUP LINKED TO THE IMPLEMENTATION OF THE AVIATION SYSTEM BLOCK UPGRADES (MDWG-ASBUs)

The working group will be composed of experts from States, international organizations and industry, more specifically; those involved in air traffic management (ATM) modernization programmes in which the notion of incentives is applied.

The working group will actively assist the Secretariat in the work required as follow-up to the Sixth Worldwide Air Transport Conference (AT/Conf/6), Conference Recommendation 2.7/1 b) refers, and report on its progress to the Council during the first quarter of 2015, as follows:

- a) develop a benchmark of current best practices for similar approaches in the aviation system block upgrade implementation and/or others ATM modernization programmes;
- b) consider the definition and applicability of economic and operational incentives as well as mandates. In doing so, consider the aspects of equipage, training, certification and operational approval, etc.;
- c) determine the parameters and definitions of access, equity and service priority and financial incentives policies;
- d) consider how the policies might be applied in practice at a State level or regional level;
- e) evaluate to the extent possible the effectiveness of these policies;
- f) consider how they could be reflected in existing ICAO policies and other guidance material; and
- g) present the economic and financial findings to the Airport Economics Panel and the Air Navigation Services Economics Panel (AEP-ANSEP/5, Montréal, 24 to 28 November 2014) to determine if and how the existing guidance could be amended to incorporate the findings. It is noted that, determining whether such practices are consistent with ICAO's policy on non-discrimination, is necessary.

According to the report of the MDWG, the following tasks have to be addressed by WG 1: Identification of best practices for incentives (including operational and financial incentives) supporting the implementation of ASBUs

1. Identification of the different types or level of service priority;
2. Identification of operational policies that are currently used;
3. Identification of the different type of incentive;
4. Evaluation, to the extent possible, of the effectiveness of the afore-mentioned;
5. Identification of the stakeholders impacted by the ASBUs implementation and the geographic level in the implementation;
6. Consider the aspects of equipage, training, certification and operational approval, etc.;
7. Elaboration of common definitions.

These tasks can be delivered in several steps:

1. establish an inventory of best practices in existing operational and financial incentives in a first version of the main report on incentives;
2. determine the parameters and definitions of, for example, service priority policies to be included in a second version of the main report

3. establish an inventory of existing financing schemes to be included in a third version of the main report
4. evaluate to the extent possible the effectiveness of the afore-mentioned to be included in a fourth version of the main report
5. develop guidance material for business cases and CBA to be included in the fifth version of the main report
6. consider how the policies might be applied in practice at a State level or regional level to be included in a 6th version of the main report
7. consider how the findings could be reflected in existing ICAO policies, guidance material and GANP as well as in coordination mechanisms

Annex 2: text for update of the GANP: PM

Annex 3: text for existing ICAO doc

Such as [Doc 9082, 9261](#) etc.

Annex 4: report of WG1

The main text of the report of WG1 or special information not covered in Annex 2 and 3
