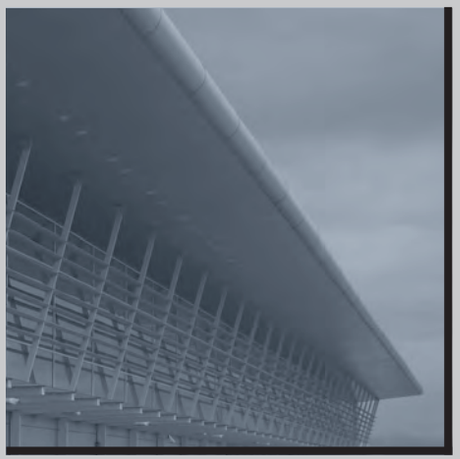
AIRPORTS OF MONTENEGRO MASTER PLAN 2011



CLIENT: EUROPEAN INVESTMENT BANK (EIB)
SPONSOR: AIRPORTS OF MONTENEGRO (APM)

MAY 2011

Halcrow

Contents

Information

This Airports of Montenegro Master Plan 2011 has been prepared by Halcrow Group Limited (Halcrow) on behalf of the project sponsor, Airports of Montenegro (APM), at the request of the funding agency, the European Investment Bank (EIB).

This Master Plan addresses and makes recommendations on the future infrastructure requirements and associated capital costs based on a projected level of unconstrained passenger demand at Podgorica and Tivat Airport up to 2030. This work in turn is based upon information and data made available to the Consultant at the time of drafting the document and interim documents associated with forecast air traffic projections. Every care has been taken with the interpretation and application of that information and data however no liability is accepted for its accuracy or for the consequences of decisions made by any third party relying on recommendations made in the Airports Master Plan.

The Airports Master Plan has been prepared in English whilst the Forward, Opening Address and Executive Summary have also been translated into Serbian. The English language version prevails for the purposes of interpretation.

Foreword by Mr. Milovan Đuričković, Director of Airports of Montenegro

It is with immense pleasure that I present to you this update and revision of the Airports of Montenegro Master Plan. This document represents a defining milestone for the future expansion and development of our airports at Podgorica and Tivat. It also supports our on-going mission to provide a high quality, environmentally responsible, safe and secure airport for passengers and employees alike whilst remaining the airport of choice for tourists and visitors to the Balkans.

We have come along way since taking over Podgorica and Tivat Airports and the first Airports Master Plan was undertaken. We have invested heavily in the future prosperity of our airports system and were rewarded in our endeavours by welcoming our millionth passenger in 2008. In the same year we also gained ISO 9001:2000 accreditations for our Quality Management System, which is a testament to the quality of our airports personnel and management. This recognition also coincided with Podgorica Airport being honoured with the title of 'Best airport under 1 million passengers' by Airports Council International Europe, something which we are immensely proud of. In awarding this prestigious title, the judging panel commented on Podgorica Airport's, "remarkable and fast evolution from a non-existing infrastructure to an airport that can compete with international standards in an impressively short amount of time".

Amongst the many challenges which lie ahead is navigating a path through these turbulent economic times. I strongly believe that this Airports Master Plan represents an important first step in achieving this goal whilst not losing sight of our ultimate vision.

Please join me as we venture forth on this exciting journey, striving for excellence whilst seeking to maintain the future growth and prosperity of our great nation.

DIRECTOR OF AIRPORTS OF MONTENEGRO
Mr. Milovan Đuričković

Предговор Mr. Milovan Đuričković Директор аеродрома Црна Гора

Имам огромно задовољство представити Вам ову допуну и ревизију Аеродрома Црна Гора Мастер плана. Овај документ представља прекретницу за дефиницију будућег проширења и развоја наших аеродрома у Подгорици и Тивту. Овај Мастер план такође подржава нашу дуготрајну намјеру да обезбједимо високи квалитет, еколошки одговорне, безбједне и сигурне аеродроме подједнако за путнике и запослене, као и аеродром избора за туристе и посетиоце Балкану.

Велики смо пут пресли од преузимања аеродрома Подгорица и Тиват и од када је први аеродрома Мастер план обављен. У великој мјери смо уложили у будући просперитет наших система аеродрома и награђени у нашим настојањима дочеком нашег милионитог путника у 2008. У истој години добили смо и ИСО 9001:2000, акредитације за наш систем управљања квалитетом, што је доказ квалитета наших аеродрома особља и менаџмента. Ово признање се поклопило са добијањем титуле 'Најбољи аеродром до 1 милиона путника' од Аеродромског Међународног Савјета Европе, цега смо изузетно поносни. При додјели ове престижне титуле, жири је коментарисао да је Аеродром Подгорица показао ", изванредну и брзу еволуцију у импресивно кратком времену од непостојеће инфраструктуре до аеродрома који може да се такмичи са међународним стандардима ".

Међу многим изазовима који леже пред нама је пловити овим турбулентним економским временима. Ја чврсто верујем да овај Мастер план Аеродрома представља важан први корак у остваривању овог циља, не губећи из вида наше крајњие визије.

Молимо Вас да нам се придружите у потхвату на овом узбудљивом путовању, тежећи изврсности, као и одржавању будућег раста и просперитета наше значајне нације.

ДИРЕКТОР Аеродрома ЦРНА ГОРА
Милован Ђуричковић

Opening Address

By Mr. Bill Millington

On behalf of Halcrow Group Limited, I am pleased to present to you the Airports of Montenegro Master Plan 2011. This Airports Master Plan has been prepared on behalf of the project sponsor, Airports of Montenegro and at the request of the European Investment Bank.

The Airports Master Plan addresses the future development and capital investment requirements for both Podgorica and Tivat Airport. This is in accordance with the project objective which is:

"To deliver a phased achievable Airport Master Plan up to 2030 which is compliant with international and national regulations; meets forecast demand requirements and service quality aspirations; minimises capital and operational costs, whilst maximising affordability and commercial opportunity"

The plans and drawings included within this document illustrate how it is envisaged in the Master Plan that Podgorica and Tivat Airport will develop over time in a sustainable and cost efficient manner to meet forecast levels of demand up until 2030.

In striving to meet these goals and aspirations we believe that Halcrow has created a clear long term vision which will have the support of all stakeholders by providing a firm yet flexible road map for delivering profitable and sustainable future growth.

We hope that our Airports Master Plan instils a belief with the Airports of Montenegro that they can proceed with certainty whilst providing the European Investment Bank with the confidence to invest in the future growth and prosperity of this historic and proud nation.

Bill Millington BSc., MSc., CEng., MICE.
Development Director
Halcrow Airports and Air Transport
Halcrow Group Limited

Уводно Обраћање

Mr. Bill Millington

У име Halcrow Group Limited, имам част представити Вам 2011 Аеродроми Црна Гора Мастер план. Мастер план је припремљен у име носиоца пројекта, Аеродроми Црна Гора, и на захтев Европске Инвестиционе Банке.

Аеродроми Мастер план се односи на будући развој и захтјеве капиталне инвестиције за оба аеродрома Подгорица и Тиват. То је у складу са циљем пројекта који је:

"Доставити фазну остварљиву испоруку Аеродром Мастер плана до 2030 која је усклађена са међународним и националним прописима; и у исто вријеме испуњава ниво потражње, као и тежње квалитети услуга, смањује капитал и оперативне трошкове, са максималним значајем на финанцијску приступачност и комерцијалне могућности"

планови и нацрти укључени у овај документ илуструју мастер планом предвиђени развој за Аеродроме Подгорица и Тиват током времена на одржив и финанцијски ефикасан начин који ће задовољити ниво потражње до 2030.

У настојању да испуне ове циљеве и аспирације верујемо да је Halcrow приредио јасну дугорочну визију која ће имати подршку свих заинтересованих страна пружајући чврст али флексибилан пут за испоруку профитабиланог и одрживог будућег раста.

Надамо се да ће наш Мастер план аеродрома улити повјерење да Аеродроми Црна Гора настављају са сигурношћу као и показати Европској Инвестиционој Банци са поверењем да инвестирају у будући раст и просперитет овог историјског и поносног народа.

Bill Millington BSc., MSc., CEng., MICE.
Development Director
Halcrow Airports and Air Transport
Halcrow Group Limited

Executive Summary

Preliminary Information

The 2011 Airports of Montenegro Master Plan sets out a physical development strategy for Podgorica and Tivat airports for the period 2011to 2030 with sequenced improvements to capacity and service quality in response to forecast demand.

The Airports Master Plan was primarily commissioned to provide an update and review to the 2003 Airports of Montenegro Master Plan, prepared by the Barents Group as a consultant to USAID.

The document outlines a long range, orderly direction for development which will yield a safe, efficient, economical and environmentally acceptable airport system for Montenegro. It provides a two phased outline for development and gives Airports of Montenegro and government advance notice of pending needs to aid future policy formulation, budgeting and integration.

This review and update of the airports master plan for Montenegro, in keeping with standard practise, will require further review and updating within approximately five years.

The Master Plan should not be a rigid prescriptive document which dictates future development. It is a dynamic document requiring review and updating as the underlying traffic forecasts, operating, economic and other important conditions change. The current global economic crisis; vagaries of airline business models and emerging patterns of air transport in Montenegro allied to the "lumpy" nature of airport investment has required a flexible yet focused approach to the timing of future airport investment plans to accommodate traffic demands and capacity requirements.

The Master Plan is based upon the standards adopted by the International Civil Aviation Organization (ICAO) and published as Standards and Recommended Practices (SARPS) in the Annexes to the Convention on Civil Aviation (The Chicago Convention 1944) and associated manuals

The forecasts are more detailed than the 2003 Master Plan and therefore provide a more than adequate basis for future planning and investment at both airports.

The 2011 Airports Master Plan reaffirms the position adopted in the 2003 document; namely that Podgorica be fully developed as the capital city airport with a more limited development for Tivat as a regional airport.

Although the immediate focus is on Podgorica as it continues to capture a greater proportion of the market, the continued development of Tivat is important to the national interest in respect of supporting the rapidly growing tourism sector.

The 2011 Airports Master Plan seeks to integrate the requirements of both airports in the Spatial Planning system for Montenegro and thus safeguard the future requirements of Podgorica and Tivat Airport up to 2030 and beyond.

To ensure that the requirements of the 2011Airports Master Plan are safeguarded and delivered over time, the document recommends the establishment of a Program Implementation Unit. Specific details as the role and nature of the Unit are provided within the Master Plan.

Traffic Forecasts

Our unconstrained (base case) passenger forecasts for Podgorica and Tivat key stages are shown in the following table.

2011 Passenger Traffic Forecasts for Podgorica and Tivat Airports

(000's)	2010	2015	2020	2025	2030
Podgorica	648	1,136	1,898	2,883	3,220
Tivat	540	919	1,202	1,372	1,431

Source: Halcrow forecast

Podgorica's share of overall commercial air passenger traffic in Montenegro is predicted to grow from 55% in 2010 to 69% by 2030. Tivat is predicted to fall from 45% to 31% over the same period. Tourism remains the underlying purpose for the majority of air passengers flying to and from either airport.

There is a suggestion that Tivat Airport may have been operating within a peak hour airfield capacity constraint since 2007. This will require further joint investigation with Airports of Montenegro and the Program Implementation Unit to establish the true extent of any current capacity constraint during the peak hours and the extent to which peak demand can be reallocated in the adjoining off-peak periods.

Current aircraft parking capacity was fully utilised during both the peak arriving and departing hour at Tivat in 2008 and 2009 and at Podgorica, in 2008 (prior to the economic down-turn). The peak hourly movement at Tivat

for 2008 and 2009 (recorded for arrival as 08:05-09:05 and departure as 09:00-10:00 on 29th August 2009) indicates that all the existing stands were in full use with no spare capacity. The peak hourly movement at Podgorica, for 2008 (recorded as 08:05-09:05 on 9th August 2008) indicates all the existing stands were in full use with no spare capacity (N.B. We chose to present 2008 rather than 2009 peak day data for Podgorica because of the drop in traffic recorded at the airport in 2009).

The number of commercial (excluding GA) aircraft stands required at Podgorica Airport during the forecast is set to increase from 7 in 2010 to 8 in 2015, 14 in 2025 and 15 in 2030.

The number of commercial (excluding GA) aircraft stands required at Tivat Airport is forecast to increase from 13 in 2010 to 16 in 2015, 17 in 2025 and 17 in 2030.

Podgorica Airport

Podgorica remains an attractive, high quality and well managed international airport. The airport offers a full range of services to airlines, passengers, general aviation and freight operators and is a symbol of national pride and excellence.

Podgorica will continue to be developed as the primary international airport for Montenegro and is expected to handle an ever increasing proportion of traffic to and from Montenegro over the life of the Airports Master Plan. This is partly as a consequence of completion of the Sozina tunnel, which has improved access to the central and southern coast, as well as capacity constraints at Tivat Airport.

The new terminal building was officially opened on 14th May 2006 and soon won the plaudits of its peers at Airports Council International Europe. The landside, terminal and airfield facilities have generally been well planned and arranged with foresight given to future expansion and airport related requirements.

Short Term Developments

The passenger growth at Podgorica is forecast to reach the terminal capacity in around 2012 after which the terminal area will provide a reduced, inadequate level of service for passengers. Whilst this is not a limiting factor for traffic growth in the short term, expanding the terminal should not be delayed as this would create a poor quality experience for the passengers. In the medium term, as traffic continues to grow, the lack of capacity would result in operational complications and, in addition to ever decreasing standards of service, would start to limit capacity and constrain growth.

It is reasonable to allow a reduction in peak hour service levels for a period prior to development and to defer investment costs as far as practical and balance the over provision of capacity following a development stage. The proposed opening of the first stage of terminal expansion of 12,500m^2 is in 2015.

To accommodate the immediate forecast growth in passenger aircraft stand demand to 8 aircraft (5 Code C and 3 Code D) by 2015, an extension of the apron to the north is required. The GA apron is extended linearly to the south to provide an additional two self-manoeuvre parking positions.

Runway shoulders are required to achieve compliance with ICAO Annex standards for Code 4E operations together with some local taxiway widening.

Existing GSE parking and maintenance facilities do not meet operational requirements. To address this, a new GSE hard-standing is shown to the south of the ATC tower, adjacent to the expanded GA apron. A main GSE base with internal parking and major overhaul capability is also proposed. This is shown at the southern end of the passenger apron as a potential location.

Additional car parking is to the west of the existing, filling the area available up to the existing circulatory/access roads.

Podgorica Airport Master Plan 2030

A second tranche of terminal development of 12,500m^2 is proposed to the west of the short term development which is to be completed by 2023. This development with be on a rectilinear basis, thus providing enhanced operational, investment and future growth flexibility and optimisation over a continuation of the current linear arrangement.

Development of additional aircraft stands to the north west of the airport is required to accommodate forecast parking demand. Code C aircraft are shown adjacent to the terminal, with Code D remote, to maximise the number of contact stands.

A new fuel depot is shown to the north west of the site, adjacent to the expanded passenger apron, replacing the existing, time expired, facility.

An expansion of the existing cargo warehouse facility is included. A new police base is provided at the north of the remote apron and a fire training ground has been provided for.

Land has also been safeguarded for the provision of airport related commercial development. A corridor for improved public access by provision of a rail spur from the mainline to the west of the terminal area has also been safeguarded.

Additional car parking is shown to accommodate growth in passenger numbers and demand to the west of the existing.

Tivat Airport

It is not feasible to continue long-term development of the airport with passenger facilities retained in their current location due to regulatory compliance and capacity related issues. The long-term strategy is therefore to relocate the passenger terminal and aprons entirely to the south west of the airport as soon as possible. Due to restrictions in land availability and the time required to acquire this, it is expected that operations will continue in and around the current terminal location until at least 2017. Consequently, the airport will need to maintain operational capacity up to this time to meet forecast demand whilst minimising abortive investment costs.

Short Term Developments

Additional passenger terminal area is urgently required to process peak hour demand. Assuming that a new permanent facility would be open in 2017 it is recommended that facilities be provided to accommodate busy hour demand up to 2015, with an additional area of 5,000m2 to give a total of approximately 9,000m2. Due to the high seasonality of traffic, it is recommended that the expansion of the terminal facilities is achieved using a temporary facility, which is only opened at busy times. This minimises initial construction costs and operational and staffing costs, with the facility closed except for on busy summer days.

To maintain capacity through to 2017 the passenger apron is expanded to the north to provide an additional Code D, self manoeuvre stand. The GA apron is expanded to the south to provide a total of 8 self manoeuvring GA stands.

A half length parallel taxiway is provided, which will increase runway capacity to at least 17 ATM/hr, more than capable of handling the long-term forecast peak of 15. The opportunity to extend this parallel taxiway further has been safeguarded in the Master Plan.

Compliant RESAs for Runways 14 and 32 are also provided by displacing both runway thresholds. A starter extension is safeguarded for Runway 32.

Runway shoulders shall be provided to achieve compliance with ICAO SARPS for Code 4D operations together with localised taxiway widening.

A new GSE base is provided to the north of apron together with a jetty to facilitate sea access for fire and rescue services.

The existing ATC and fire station are to be upgraded as an interim measure prior to the provision of new facilities to the west of the runway in 2017 as the existing control tower significantly penetrates the Obstacle Limitation Surface.

Tivat Airport Master Plan 2030

A new passenger terminal is to be provided after 2017, to meet traffic projections up to 2030, of some 16,000m^2 in size.

A new replacement passenger apron is shown in the south west corner of the airport sized to accommodate the forecast stand requirements at 2030 of 4 Code D and 5 Code C aircraft. Accordingly a GSE base and staging areas should be provided adjacent to the passenger aprons for ease of access and operational efficiency.

With the transfer of passenger operations to the new facilities the existing passenger terminal, passenger apron and seasonal/overspill terminal are available for dedicated GA operational use.

A new fire station and ATC facility shall be provided to the west of the parallel taxiway, at approximately the mid-point of the runway. This will provide good line of sight across the entire airfield and, with a link directly to the runway, approximately equal and minimal response times to both runway ends.

A starter extension to Runway 32 is shown to ensure adequate TODA & ASDA can be maintained with the displaced Runway 32 end necessary to ensure adequate RESA at the northern runway end (14).

Whilst it is not forecast that traffic will reach peak levels requiring the provision of an extension to the parallel taxiway beyond the half-length shown in the short term, it is considered prudent to safeguard land for a future extension to allow direct access to the southern GA apron link.

The jetty constructed in the short term for emergency services use shall be expanded to provide for public access by water taxi/private boat.

The existing ATC tower and offices are obstacles, penetrating the airport safeguarded surfaces. With the provision of new ATC facilities to the west of the runway these can be demolished to improve the regulatory compliance of the airport. Furthermore, it is proposed to realign the highway to be outside of the runway strip, again to aid compliance with instrument operation and associated clearances.

Introduction of Satellite Based Navigation

Although not part of this core Airport Master Plan proposal, we have concluded from our initial investigations that the application of a GNSS-based navigation solution should offer Tivat some significant operational benefits

and would allow the airport operation to be extended during reduced visibility conditions. These improvements would benefit Tivat considerably in addition to providing a partial or full length parallel taxiway to increase runway capacity.

Резиме

Прелиминарне информације

2011 Аеродроми Црна Гора Мастер план представља физички развој стратегије за аеродроме Подгорица и Тиват за период 2011 до 2030 тодине са редоследом побољшања капацитета и квалитета услуга као одговор на ниво потражње.

Аеродроми Мастер план је пре свега био наручен да обезбеди допуну и ревизију 2003 Аеродроми Црна Гора Мастер плана, који је припремио Барентс Група као консултант УСАИД-а.

Овај документ описује дугорочни правац развоја који ће одредити сигуран, ефикасан, економичан и еколошки прихватљив систем аеродрома Црна Гора. Тиме пружа оквир за двије фазе развоја и даје Аеродромима Црне Горе и Влади унаприједни приказ будућих потреба за формулисање стратегије, буџетирања и интеграције.

Ова допуна и ревизија мастер плана аеродрома за Црну Гору, у складу са стандардном праксом, ће захтјевати даље разматрање и ажурирање у року од приближно пет година.

Мастер план не треба да буде крути законодавни документ који диктира развој. То је динамичан документ који захтева ревизију и ажурирање, као и основне саобраћајне прогнозе, оперативне, економске и друге релевантне промене у околностима. Тренутна глобална економска криза, неизвјесност модела авио пословања и нове форме ваздушног саобраћаја у Црној Гори заједно са непредвидивом природом аеродромских инвестиција треба флексибилан приступ у исто вријеме фокусиран на будуће инвестиционе планове аеродрома да покрије захтјеве саобраћаја и капацитета.

Мастер план се заснива на стандардима који су усвојени од стране Међународне организације за цивилно ваздухопловство (ИЦАО) и објављени као стандарди и препоручене праксе (САРПс) у Анекси уз Конвенцију о цивилном ваздухопловству (Чикаго Конвенцијом 1944) и пратећих упутстава

Прогнозе саобраћаја су детаљније од 2003 Мастер плана и дакле пружају више него адекватну основу за будуће планирање и инвестиције на оба аеродрома.

2011 Аеродроми Мастер план потврђује став усвојен у 2003 документу, наиме, да Подгорица буде потпуно развијен, као аеродром главног града, док више ограничен развој је прихваћен за Тиват, као регионални аеродром.

Иако је фокус на Подгорици јер наставља да покрива већи део тржишта, позиција Тивта и његов континуирани развој је важно за национални интерес.

2011 Аеродроми Мастер план има за циљ да интегрише потребе оба аеродрома у просторном планирању система Црне Горе и на тај начин штити будуће захтеве у Подгорици и аеродром у Тивту до 2030 и даље.

Да би се обезбедило да се потребе 2011 Аеродроми Мастер плана одрже и испоруче током времена, овај документ препоручује оснивање Програма за имплементацију. Специфични детаљи, као и улога и природа оваквог програма је у оквиру Мастер плана.

Прогнозе саобраћаја

Неспутане (базни случај) авио путничке прогнозе за Подгорицу и Тиват кључне фазе приказане су у следећој табели.

2011 Путнички саобраћај Прогнозе за аеродрома Подгорица и Тиват

(000's)	2010	2015	2020	2025	2030
Podgorica	648	1,136	1,898	2,883	3,220
Tivat	540	919	1,202	1,372	1,431

Извор: Halcrow прогнозе

Подгорица удјео укупног комерцијалног ваздушног саобраћаја путника у Црној Гораи је предвидјен да расте од 55% у 2010 на 69% до 2030. У Тивту је предвидјен пад од 45% до 31% у истом периоду. Туризам је и даље основни циљ за већину авио путника према и од оба аеродрома.

Могуће је да Тиватски аеродром послује на врхунцу ограничења капацитета од 2007. То ће захтевати даље заједничке истраге са Аеродромима Црна Гора и Програма за имплементаци да би се успоставио прави степен тренутне капацитете ограничења током шпица и до које мјере вршних потреба може бити додјељивани у ван шпице периодима.

Тренутни капацитет за паркинг ваздухоплова је у потпуности искоришћен током обе шпице доласка и одласка у Тивту током 2008 и 2009 и у

Подгорици, у 2008 (прије економске кризе). Врхунац шпице у Тивту за 2008 и 2009 (снимљене за долазак као 08:05-09:05 и одласка, као 09:00-10:00 29. август 2009) указује да су сви постојећи стандови били у потпуности искорштени без резервних капацитета. Врхунац по сатима у Подгорици, за 2008 (регистровани као 08:05-09:05 9. август 2008) указује на све постојеће стандови су били у потпуности искорштени без резервних капацитета (НБ: Изабрали смо да представимо 2008 уместо 2009 податаке врхунац дана за Подгорицу, због пада у саобраћају снимљене на аеродрому у 2009).

Број комерцијалних (искључујући ГА) авионских стандова потребних на Подгоричком аеродрому прогнозом је предвидјен на повећање од 7 у 2010 до 8 у 2015,, 14, у 2025 и 15 у 2030.

Број комерцијалних (искључујући ГА) авионских стандова потребних на Аеродрому Тиват прогнозом је предвидјен да се повећа са 13 у 2010 до 16 у 2015, 17 у 2025 и 17 у 2030.

Аеродром Подгорица

Подгорица је атрактиван, квалитетан и добро управљан међународни аеродром. Аеродром нуди пун спектар услуга авио-компанија, путника, авијације и теретних оператора и тиме је симбол националног поноса и квалитете.

Подгорица ће наставити да се развија као примарни међународни аеродром Црне Горе и очекује се да це подниjети све већи дио саобраћаја према и од Црној Гори током трајања важности Мастер плана за аеродроме. Ово је дјелом као посљедица завршетка тунела Созина, којим је побољшан приступ централне и јужне обале и ограничења капацитета на Тиватског аеродрома.

Зграда новог терминала званично је отворена 14. маја 2006, и похваљена је на скупу Савјета Међународних Аеродрома Европе. Јавни дио зграде,, терминал и аеродром пратећи објекти су генерално добро планирани , узимајући у обзир предвиђено будуће проширење и потребе аеродрома.

Краткорочни Развој

Путнички раст у Подгорици по прогнози ће достићи капацитет терминала око 2012, послије чега ће простор терминала обезбjеђивати неадекватан ниво услуге за путнике. Иако то није ограничавајући фактор за раст саобраћаја у кратком року, ширење терминала не би требало да буде одложено, јер то би створило не пријатно искуство за путнике. У средњорочном року, ако саобраћај наставља да расте, недостатак капацитета довело би до оперативних компликација, и у додатку смањеним стандардима услуга, узроковати ограничен капацитет и ограничен раст.

Разумно је допустити смањење нивоа у шпици за период пред развојну фазу и одложи ти инвестиционе трошкове колико год је практично и равнотежирати додатне капацитете након фазе развоја. Предложено отварање прве фазе терминала додатних 12.500м^2 је у 2015.

Одмах да се прилагоде расту прогнозу тражње у путничком авиону стоји на 8 авиона, 5 Кодекса Ц и Д 3 број 2015 од стране продужетак кецељу на северу. ГА кецеља је линеарно проширена на југ да обезбеди још два-само маневар места за паркирање.

Писта рамена су потребни да се постигне усаглашеност са ИЦАО Аннек стандардима за број, заједно 4Е операције са локалним такси стазе проширењима.

Постојећа зона за опрему за авио подршку, паркинг и објекати за одржавање не задовољавају оперативне услове. Да би се ово ријешило, нова зона за авио подршку је приказана јужно од контролног торња, поред проширена за ГА писту. Главна зона за авио подршку и база за опрему са унутрашњим паркирањем и великим ремонт капацитетом је такође предложена. Ово је приказано на јужном крају путничцке писте као потенцијална локација.

Додатни паркинг је западно од постојећег, попуњавајуци простор на располагању до постојећих саобраћајница / прилазним путевима.

Аеродром Подгорица Мастер план 2030

Друга транша терминала развоја од 12.500м^2, предложена је западно од зоне краткорочног развоја који треба да буде завршен до 2023. Овакав развој је на солидној основи, обезбеђујући повећану операциону, инвестиције и флексибилност за будући раст и оптимизацију путем линеарног продужетка садашњег аранжмана.

Нови паркинг за авионе сјеверо-западно од аеродрома ће бити изграђен да задовољи предвидјену прогнозу. Код Ц авиони су приказани поред терминала, са Цоде Д на даљим стандовима, како би се повећала број контакт стандова.

Нови депо горива је приказан сјеверозападно од локације, поред проширења писте путника, који је заменио постојећи дотрајали објекат.

Проширење постојећег објекта карго складишта је укључен. Нова полицијска база је обезбеђена на сјеверу даље писте и ватрогасна зона за припрему и одбрану је предвиђена.

Додатна локација је сачувана за проширење аеродромске комерцијалне зоне. Коридор за побољшан приступ и додатак жељезничког терминала од главне жељезнице на западу до терминала је такође сачувана.

Додатни паркинг је приказан који це се прилагодити расту броја путника и потребама аеродрома западно од постојећег.

Аеродром Тиват

Није изводљиво да се настави дугорочни развој аеродрома са путничким објеката задржали у својој тренутној локацији због компатибилан и капацитета питањима. дугорочна стратегија је дакле да се пресели терминала путничког и кецеља ср-масовно да се југозападно од аеродрома у најкраћем могућем року. Због ограничења у земљи у вези распололивости и време потребно за стицање, очекује се да ће се операције наставити у и око тренутне локације терминала барем до 2017. Због тога, аеродром ће морати да се одржи оперативни капацитет до овог пута да задовољи тражњу, док прогноза минимизирање неуспелог инвестициони трошкови.

Краткорочни Развој

Додатни путничког терминала области је хитно потребно да се процес вршне потражње сат. Под претпоставком да ће нови стални објекат бити отворен у 2017 се препоручује да се обезбеди објекте за смештај вршних потреба до 2017, са додатним површине 5.000 м2, како би укупно око 9.000 м2. Због високе сезонског саобраћаја, препоручује се да се проширење капацитета терминала се постиже коришћењем привремени објекат, што је само отворен у врху пута. Ово смањује иницијалне трошкове изградње и оперативне трошкове и запослених, уз објекат затворен осим на врху летњим данима.

Да бисте задржали капацитета до 2017 је путнички прегача проширила на север да обезбеди додатну број Д, само маневар стоје. ГА кецеља је проширен на југу да обезбеди укупно 8 себи маневарских ГА стоји.

пола дужине рулне стазе паралелне је обезбеђен, што ће повећати капацитет писте на најмање 17 банкомату / х, више него способна руковање дугорочних прогноза врхунац од 15 година. прилика да се прошири овај паралелни даље је сачуваних у Мастер плану.

Усаглашен РЕСАс за Писте 14 и 32 су такође обезбеђени потискивањем обе писте прагови. Стартер екстензија је обезбеђено за Писте 32.

Писти рамена треба да се обезбеди да се постигне усаглашеност са ICAO SARPS 4Д САРПс за операције, заједно са локализованим рулне стазе проширења.

Подршка терену опрема нова база је под условом да се северно од кецељу, заједно са Јетти се олакшао приступ мору за ватрогасно-спасилачке службе.

постојеће АТЦ и ватрогасна станица треба да се надограђује, као привремене мере пре пружање нових објеката за западно од писте у 2017, као постојећи контролни торањ значајно продире препрека Ограничење површина.

Аеродром Тиват Мастер план 2030

Новог путничког терминала је да се обезбеди по 2017, да се састане пројекције саобраћаја до 2030, од око 16.000 м2.

Замена нови путнички кецељу је приказан у југозападном углу аеродрома величине да прими захтеве прогноза штанда на 2030 од 4 број Д и 5 кодова Ц авиона. Сходно томе Подршка терену опрема базу и скеле области треба обезбедити поред путника кецеље за једноставност приступа и оперативне ефикасности.

Уз трансфер путника операција за нове објекте постојећих путничких терминала, путничким кецељу и сезонске / прекобројно становништво терминала су доступни за посвећене ГА оперативну употребу.

Нова ватрогасна станица и АТЦ објекат треба да се обезбеди на западу паралелних рулне стазе, на приближно средином тачка писте. Ово ће обезбедити добру линију поглед преко целог аеродрома и, са линком директно на писту, приближно једнака и минимално време одзива на оба краја писте.

Стартер продужење до писте 32 се приказује да обезбеде адекватну ТОДА & АСДА може одржавати са писте 32 расељених краја неопходно да се обезбеди адекватна РЕСА на северном крају писте (14).

Иако није предвиђа да ће саобраћај достићи врхунац нивоима захтева пружање проширење рулне стазе паралелне иза пола дужине приказане у кратком року, сматра се да је мудро да заштите земљишта за будуће проширење да омогући директан приступ југу ГА кецеља везу.

Јетти изграђена у кратком року за услуге хитне употребу ће бити проширен да обезбеди јавни приступ воденим таксијем / приватни брод.

АТЦ постојеће куле и канцеларије су препреке, продоран аеродрома заштићено површина. Са одредбама новог АТЦ објеката западно од

писте Ови се могу срушена да се побољша регулаторни сагласност аеродрома. Такође, предложено је да се поравнати аутопута буде ван писте траке, опет у помоћ у складу са инструментом рада и повезаних дозвола.

Увођење сателита за навигацију

Иако није део овог језгра Аеродром Мастер плана предлог, ми смо закључили из наших почетних испитивања да би примена ГНСС-навигациони решења нуде Тивту неке значајне оперативне предности и да ће омогућити аеродрому да се прошири операције у условима смањене видљивости. Ова побољшања ће имати користи знатно Тивту поред пружања делимично или целом дужином паралелног рулне стазе за повећање капацитета писте.

1 Introduction

1.1 Overview Purpose and Scope of the Study

In 2010 the European Investment Bank (EIB) commissioned Halcrow Group Ltd to 'Review and update the Airports Master Plans for Montenegro together with undertaking certain associated works presented in this document.

1.1.1 Need and Purpose

The underlying purpose of the project is to identify measures by which APM can continue to viably provide the required capacity and appropriate level of service to accommodate air traffic demand at Podgorica and Tivat Airports in the future and in doing so, to be able to meet all the relevant international safety and security standards and other relevant regulations.

In addition, APM sought cost effective capacity improvements that can be swiftly implemented in order to meet the foreseen traffic levels and forecast demand. Furthermore, any future land and infrastructure requirements included within the AMP would need to be safeguarded and incorporated within the Spatial Planning process and objectives for Montenegro by the consultancy responsible for undertaking this work, Montecep.

1.1.2 Scope

The scope of this study includes the review and update of the 2003 Master Plan for Podgorica and Tivat Airport together with new traffic forecasts and accompanying phased development and capital investment plans. This will enable both airports to provide the necessary capacity; service levels; security and safety standards up until 2030 presented in the form of a new AMP for Montenegro.

1.1.3 Exclusions

Specifically excluded from our scope of works are the following:

- Any detailed traffic forecasts of cargo due to the unavailability of data;
- Any detailed environmental investigations, although environmental issues have been assessed at the requisite level of detail for master planning purposes associated with the development options identified;
- Any detailed optimised demand management of scarce runway and airfield capacity resulting from General Aviation and civil aviation requirements, particularly affecting Tivat Airport. This again is due to insufficient data on existing peak demand profiles for both markets and time sensitivities and demand elasticities.
- Airspace capacity assessments and the introduction of extended hours and night time flight operations, particularly at Tivat Airport.

1.2 Airports Master Objectives

The overarching study objective is to: "To deliver a phased achievable Airport Master Plan up to 2030 which is compliant with international and national regulations; meets forecast demand requirements and service quality aspirations; minimises capital and operational costs, whilst maximising affordability and commercial opportunity"

1.2.1 EIB Objectives

EIB have three key objectives under the terms of this Master Plan study which are summarised as follows:

- Objective 1: The AMP is reviewed and updated.
- Objective 2: The investment programmes are established for i) the short term (5 years) and ii) the longer term (up to 2030).
- Objective 3: The activities and necessary steps for the implementation of the short-term programme are developed.

1.2.2 APM Objectives

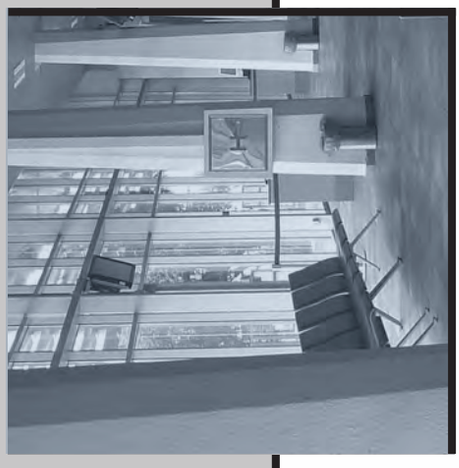
The objectives of APM for this Master Plan can be summarised as follows:

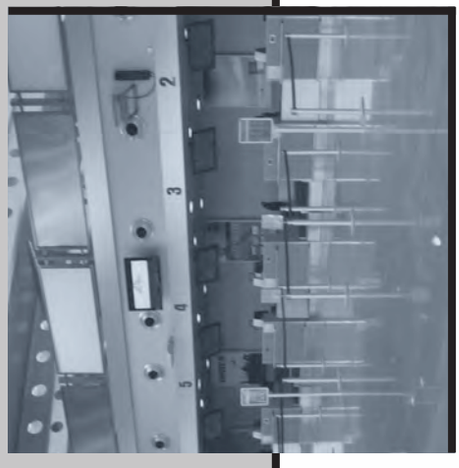
- Maximise the use of existing infrastructure and scarce land resources, particularly over the next 5 years
- As far as possible, meet forecast level of aircraft and passenger demand
- Understand when proposed new capacity related infrastructure is expected to become operational
- Understand the capital costs related to proposed new infrastructure
- Avoid unnecessary and abortive investments
- Achieve value for money
- Optimise levels of passenger service
- Ensure operational acceptability and continuity
- Meet the needs and demand requirements of General Aviation
- Promote environmental best practice
- Ensure that the Airport Master Plan requirements are sufficiently understood and safeguarded for by politicians and decision makers
- Ensure integration and safeguarding of airports master planning requirements within the Spatial Planning System

1.2.3 Spatial Planning Objectives

The objectives of the Spatial Planning process in relation to this Airports Master Plan can be described as follows:

- Ensure that the Airport Master Plan requirements are sufficiently understood and safeguarded for by politicians and decision makers
- Ensure integration and safeguarding of airports master planning requirements within the Spatial Planning System, particularly for Tivat Airport (see current status shown in Appendix 1)
- Understand how the Spatial Planning System can help safeguard, facilitate and maximise the use of existing airport infrastructure and scarce land resources over the life of the Plan
- Understand what the implication and requirements are, if the airport were to meet forecast level of aircraft and passenger demand (e.g. for adjoining land uses and off-airport transport infrastructure)
- Understand the exact nature and timing of when new capacity related infrastructure is expected to become operational
- Be able to interpret the environmental and social implications of forecast levels of airport demand
- To enable the provision and/or safeguarding of urban, tourism and recreational support facilities and services
- Understand and ensure integration of demand driven requirements and avoid speculative land and resource allocation
- Understand and potentially seek to accommodate the requirements of airport related markets and services (e.g. cargo, ancillary airport services and skills base, employment and support service requirements, etc)
- Ensure social and environmental integration and integrity





2 Airports of Montenegro Master Plan

2.1 Review of the 2003 AMP including traffic forecasts projections

The 2003 Airport Master Plan Report for Podgorica and Tivat Airports presented annual and peak hour passenger and air transport movement forecasts for two cases:

- a base case that assumes the successful implementation of the core recommendations of the Tourism Master Plan and continued liberalisation of the air transport market;
- a high case that assumes full implementation of the Tourism Master Plan and integration of Montenegro into the EU aviation market by 2010.

Podgorica was expected to become Montenegro's main international airport. Tivat was expected to develop at a significantly slower rate reflecting its regional role.

- The Master Plan assumed that constraints related to the lack of a full night/IMC capability at Tivat Airport would be overcome by the installation of a VOR/DME, hazard beacons and apron floodlighting.
- Cargo throughput was projected forward using the growth rates based on the IATA medium term forecasts.

2.1.1 Air Passenger Forecasts

The Master Plan forecasts recognised that air traffic at Montenegro's two main airports would be driven largely by the projected increase in international tourism.

The report adopted the forecast increase in overnight stays set out in the 2001 Tourism Master Plan[1] and estimated the potential level of foreign visitors by assuming an average stay of 7 nights. The report also adopted the Tourism Master Plan's assumptions regarding the distribution of foreign visitors by origin over the forecast period.

It was assumed that the proportion of visitors from Western Europe arriving in Montenegro by air would remain constant overtime at 75 percent. The proportion of Eastern Europe visitors arriving by air would increase from an estimated 20 percent in 1998 to 25 percent in 2010 and 30 percent in 2020. The air mode share of 'local' visitors was projected to increase from 2 percent to 4 percent over the same period. We assume that the term 'local' includes visitors from Serbia, which was still part of Serbia-Montenegro when the Master Plan was produced.

On this basis, the 2003 Master Plan forecast that annual air passenger movements generated by the arrivals and departure of non-residents at Montenegro's two main airports would increase from 49,000 in 1998, to 999,000 in 2010 and 2.54 million in 2020 (N.B. in 1998, Podgorica and Tivat Airports actually handled 481,092 passengers).

Table 2.1 details the main assumptions relating air passenger movements to visitor arrivals.

Table 2.1: Basis of 2003 Master Plan Air Passenger Forecasts

Origin of Visitors	Nights 000	Average Stay	Visitors 000	Share by Air	Air Pax. 000
1998					
Eastern Europe	159	7	23	20%	9
Western Europe	72	7	10	75%	15
Local	4,299	7	614	2%	25
Total	4,530	7	647	4%	49
2010					
Eastern Europe	900	7	129	25%	64
Western Europe	4,150	7	593	75%	889
Local	6,350	7	907	3%	85
Total	11,400	7	1,629	31%	999
2020					
Eastern Europe	3,400	7	486	30%	291
Western Europe	10,100	7	1,443	75%	2,164
Local	7,425	7	1,061	4%	85
Total	20,925	7	2,989	43%	2,541

Note: There is a minor numerical error in the 2010 line for local visitors, which also appears in the corresponding table of the 2003 Airport Master Plan Report.

Source: AMP 2003 pages 20-31

1 Touristic Master Plan for Montenegro, DEG, May 2001.

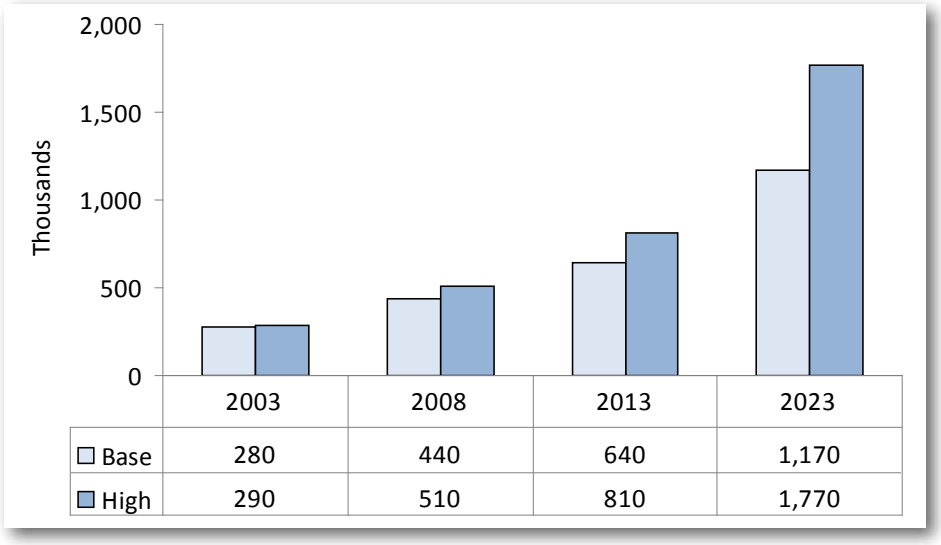
The Master Plan discusses the effect of GDP on non tourist traffic but the contribution of resident business and leisure traffic to aggregate passenger demand is not elaborated numerically and the air passenger forecasts appear to be based entirely on the projected growth in the number of visitor arrivals.

Podgorica's share of the air passenger market was projected to increase from 49 percent in 2003 to 60 percent in 2013 and 70 percent in 2023. The Master Plan report presented no formal analysis in support of the propose changes in traffic distribution.

From a level of 280,000 in 2003, annual passenger throughput at Podgorica was forecast (in the 2003 Master Plan) to grow to between 1.17 million and 1.77 million in 2023. Passenger movements at Tivat were projected to increase from 290,000 in 2003 to between 0.50 and 0.76 million in 2023 (N.B. in 2003, Tivat Airport actually handled 301,051 passengers).

Figures 2.1 and 2.2 illustrate the annual passenger forecasts for Podgorica and Tivat respectively.

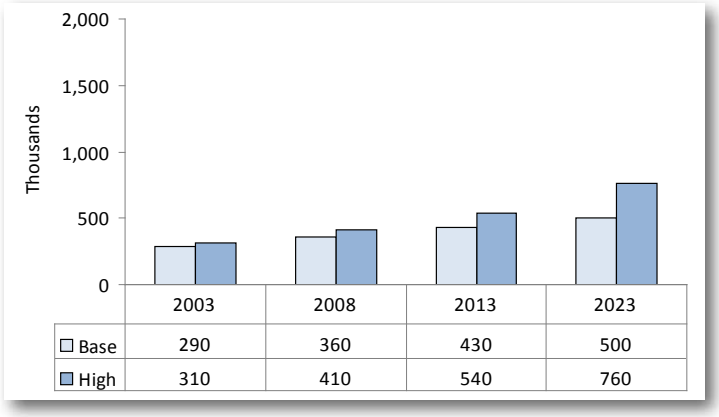
Figure 2.1: Forecast Annual Air Passenger Movements at Podgorica Airport



	2003	2008	2013	2023
Base	280	440	640	1,170
High	290	510	810	1,770

Source: AMP 2003

Figure 2.2: Forecast Annual Air Passenger Movements at Tivat Airport



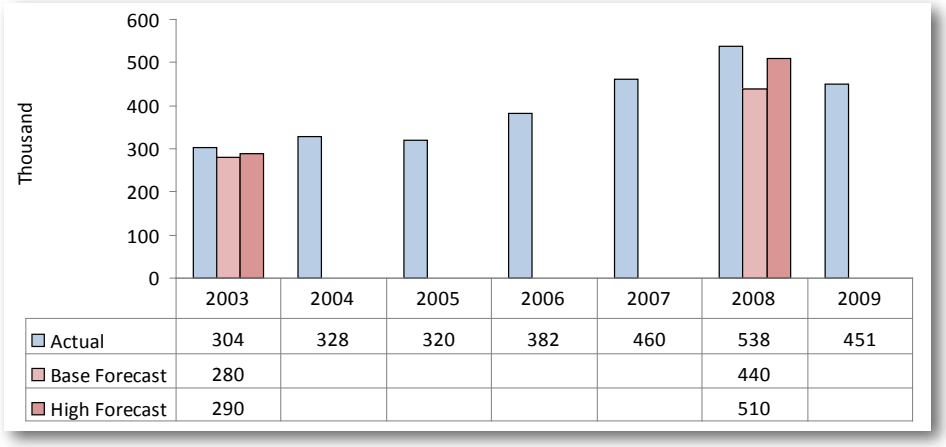
	2003	2008	2013	2023
Base	290	360	430	500
High	310	410	540	760

Source: AMP 2003

Over the past five years, air passengers at Podgorica and Tivat combined have grown more rapidly than the Master Plan forecasts envisaged. At 1.11 million, the number of air passenger movements recorded in 2008 was 38.6 percent higher than the Master Plan's base forecast for that year and 20.5 percent higher than the high forecast.

Figures 2.3 and 2.4 compares the forecast passenger throughput for 2008 to outturn figures for 2003-2009.

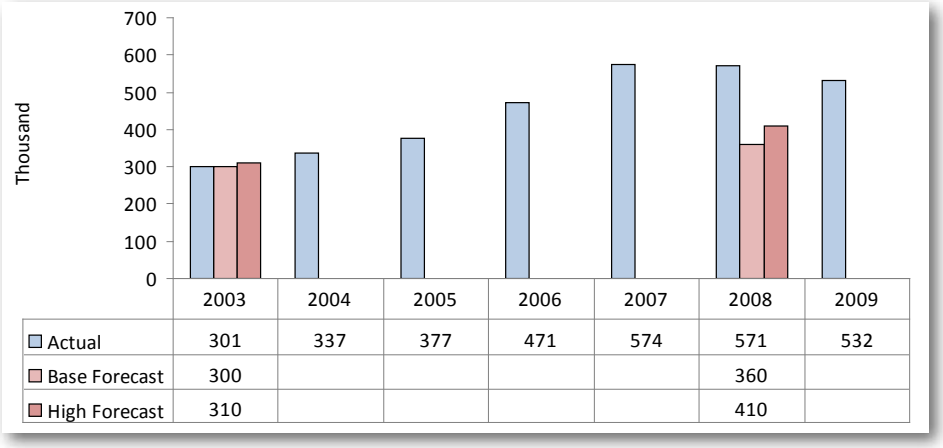
Figure 2.3: Annual Air Passengers at Podgorica Airport 2003-2009



	2003	2004	2005	2006	2007	2008	2009
Actual	304	328	320	382	460	538	451
Base Forecast	280					440	
High Forecast	290					510	

Source: Podgorica Airport

Figure 2.4: Annual Air Passengers at Tivat Airport 2003-2009



Source: Tivat Airport

Annual passengers at Podgorica in 2008 were 22.4 percent higher than the base forecast and 5.6 percent above the high forecast. The variance at Tivat is significantly higher with actual passenger throughput in 2008 some 58.6 percent higher than the base forecast and 39.3 percent above the high forecast. Podgorica's share of the air passenger market declined slightly from 50 percent in 2003 to 49 percent in 2008, compared to the Master Plan's projected increase.

Passenger throughput is still relatively modest at both airports and the apparent proximity of forecast and actual passenger levels at both airports is misleading. Total visitor arrivals[2] are lower than expected but air passenger movements are higher.

Based on the projections of visitor arrivals set out in the 2001 Tourism Master Plan, the Airport Master Plan assumed 1.629 million visitor arrivals in 2010 and projected air passenger movements ranging between 899 thousand and 979 thousand. These figures imply ratio of air passenger movements per visitor arrival of between 0.55 and 0.60.

Comparing actual data for 2008, it is clear that at 0.93, the ratio of air passenger to visitor arrivals is significantly higher than the values underpinning the air passenger forecasts set out in the Airport Master Plan 2003. The ratio for 2007 was similar at 0.91 air passengers per visitor arrival but slightly lower in 2009. The figures are compared in Table 2.8.

2 International and domestic.

Table 2.2: Comparison of Forecast and Actual Ratio of Air Passengers per Visitor Arrival

Year	Visitor Arrivals Thousands	Air Passengers Thousands	Ratio Pax/Visitors
Forecast			
2010 Base	1,629	899	0.55
2010 High	1,629	979	0.60
Actual			
2007	1,133	1,034	0.91
2008	1,188	1,109	0.93
2009	1,208	983	0.81

Source: 1) Visitor arrivals from Statistical Office of Montenegro. 2) Air passenger forecasts from Airport Master Plan Report. 3) Air passenger movements from airport traffic statistics.

The higher than expected air passenger numbers at Montenegro's airports have coincided with lower than expected visitor arrivals. This suggests that the forecasts set out in the Airport Master Plan 2003 may be based on an underestimate of the ratio of air passengers to visitor arrivals.

This could be due to:

- a higher than expected air mode share; and/or;
- the impact of resident air passenger traffic[3]; and/or;
- the lack of accurate data for the number of visitor arrivals[4] .

3 The original master plan study only considered visiting passenger arrivals. It defined a proportion of these visitors as local, which we have interpreted as referring to visitors from Serbia, then in federation with Montenegro. The master plan forecasts assumed that only 4 percent of 'local' visitors would arrive by air, which appears to have been too low. Foreign business visitors are implicitly included in total visitor arrivals but the previous master plan study appears not to have taken into account business, leisure or VFR air passenger movements generated by residents of Montenegro.

4 It should be noted that in the opinion of APM, the calculated ratio of passenger/visitor is unreasonably high, which they believe is a consequence of the fact that a high number of arriving tourist are not officially registered and therefore, the statistical data is unreliable (a caveat noted in the strategy of tourism development). However, by the same token no data exists to provide a fact based counter point. We have therefore based our analysis on official published data.

2.2 Strategic role and user characteristics of the airports

Airports role and characteristics

APM and Montenegro Airlines voiced their concern that Transfer Facilities at the Airport were insufficient for requirements. Both felt that Podgorica Airport had an opportunity to grow Transfer traffic and that facilities had to be improved in order to successfully grow this opportunity. We have assessed the scale and growth of Transfer traffic as it provides a driver for accelerating the need for new investment, particularly terminal facilities. Transfer traffic did not appear to be an issue at Tivat Airport due to its 'regional' traffic focus.

During our visit, we were informed by APM that Podgorica Airport was well placed to serve the coast for two reasons. Firstly, it was a reasonable alternative to serve Kotor, Budva and the northern coastline in the event that Tivat Airport becomes capacity constrained. Secondly, that the Sozina Tunnel had improved the ease and speed of access to the new tourism development expected along the south-east coastline.

Our initial thoughts regarding the potential for Podgorica to serve the northern coastal areas of Montenegro is that, barring delays at the border (which EU membership should in theory minimise) Dubrovnik and possibly Trebinje will always be the most convenient airport for visitors accessing what is only a limited proportion of Montenegro's tourist accommodation (<10%). In addition, the operational constraints currently experienced by Tivat might well substantially increase the 'leakage' of passengers to Dubrovnik over time.

With regards to the second point made by APM, the Sozina Tunnel has undoubtedly improved journey times and perceived ease of access to the southern coastal areas in Montenegro. This can only be positive for facilitating and unlocking development potential in this area. In recent years there has been a lot of interest in major developments in the area of the Bojana Valley, which forms the border with Albania. These development interests have now subsided with the global economic downturn, but it might not be unreasonable to assume that once the global economy recovers and private investor confidence returns, these proposals for sizeable developments in Bojana (south of Ulcinj) will be re-examined and brought to fruition over the duration of the AMP.

The key therefore, to facilitating growth at Tivat is the extent to which current operational and capacity constraints can be removed by introducing additional infrastructure and operational procedural guidelines such that the airport can meet (and not constrain or delay meeting) forecast levels of unconstrained traffic demand.

2.3 Airports of Montenegro Traffic Forecasts (2011)

2.3.1 Total Montenegro Air Passenger Market

Following the analysis and assumptions outlined in section 2.1 and 2.2 (and discussed in more detail in our 'Final Interim Report, January 2011'), our total annual forecasts for Montenegro are shown below (Table 2.3 and Figure 2.5). This is split by market sectors (Table 2.3) and compares our forecasts against those in the 2003 Airport Master Plan (Figure 2.5).

Table 2.3: Forecast Growth in Montenegro Air Passenger Market

Year	2009	2010	2015	2020	2025	2030
Total Passengers (000)						
Actual	983	-	-	-	-	-
Low Forecast	-	1,188	1,753	2,380	3,006	3,617
Base Case	-	1,188	2,063	3,113	4,265	4,639
High Forecast	-	1,188	2,735	4,869	5,361	5,742
Annual Increase		2010	2011-15	2016-20	2021-25	2026-30
Low Forecast		20.9%	9.2%	6.3%	4.8%	3.8%
Base Case		20.9%	12.8%	8.6%	6.5%	1.7%
High Forecast		20.9%	19.3%	12.2%	1.9%	1.4%
Business Passengers (000)						
Actual	94	-	-	-	-	-
Low Forecast	-	119	135	151	164	173

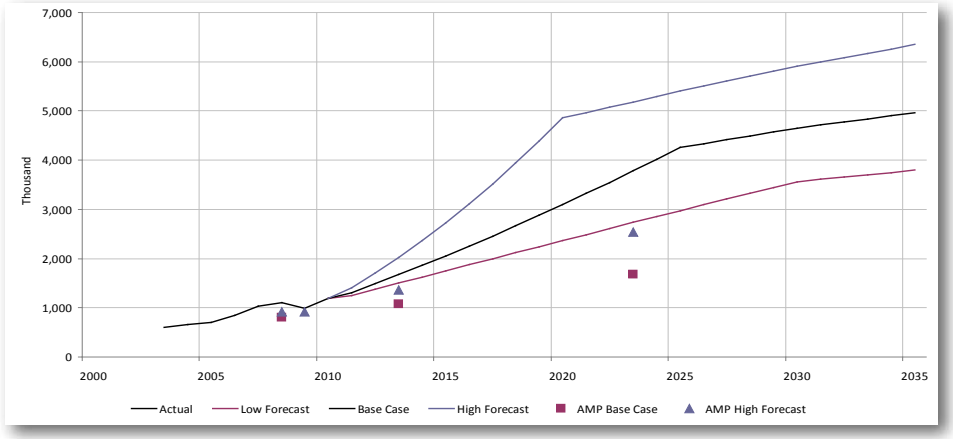
Table 2.3 cont.

Year	2009	2010	2015	2020	2025	2030
Base Case	-	119	146	176	204	227
High Forecast	-	119	154	196	240	280
Resident Leisure & VFR Passengers (000)						
Actual	110	-	-	-	-	-
Low Forecast	-	139	195	259	325	387
Base Case	-	139	214	304	399	486
High Forecast	-	139	233	353	479	590
Visiting VFR Passengers (000)						
Actual	56	-	-	-	-	-
Low Forecast	-	60	76	99	122	140
Base Case	-	60	83	117	150	177
High Forecast	-	60	91	136	181	217
Visiting Leisure - Tourist Passengers (000)						
Actual	773	-	-	-	-	-
Low Forecast	-	871	1,347	1,871	2,396	2,917
Base Case	-	871	1,620	2,516	3,512	3,749
High Forecast	-	871	2,257	4,184	4,461	4,656

Source: Halcrow forecasts[5]

5 The methodology and assumptions used to derive business, resident leisure and VFR passengers were presented in Section 2.16.

Figure 2.5: Projected Growth of Annual Air Passenger Movement at Montenegro Airports



Source: 2003 AMP and Halcrow forecasts.

The difference between the 2003 Airport Master Plan and our current forecasts can be attributed to two main aspects:

The number of passengers envisaged arriving by air has grown far more than originally expected (Table 2.3 refers) leading to a cumulatively higher base annual throughput at Podgorica and Tivat;

More detailed historic traffic data and better traffic forecast correlation to key drivers (e.g. tourism) have enabled us to generate realistic projections over the medium and long term.

Our Base Case[6] forecasts project an increase in the Montenegro air passenger market from 1.19 million in 2010 to 2.06 million in 2015, 4.26 million in 2025 and 4.64 million in 2030.

The projected growth of the air passenger market is generated primarily by:

- The expected increase in foreign visitor arrivals based on the Tourism Development Strategy targets (delayed by five years from 2020 to 2025); and
- An increase in the proportion of foreign visitors arriving by air.

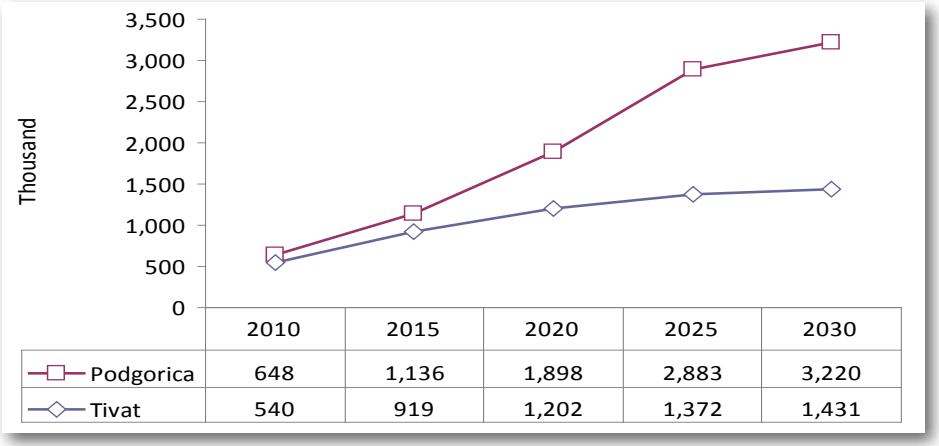
6 Our Base Case forecast assumes that the current economic crisis will delay the achievement of the Tourism Strategy's targets by five years to 2030. By contrast our High Forecast represents the situation in which the strategy's targets are met on schedule, i.e. by 2020. As such its sole purpose is to indicate the scale of airport facilities required to support the tourism development strategy if it were to proceed on schedule; the forecast exceeds our assessment of the upper bound of likely outcome. Refer to sub-sections 2.11.4 and 2.11.5 for the definition of 'low', 'base case' and 'high' passenger forecast scenarios.

The forecasts are extremely sensitive to these two key assumptions.

2.3.2 Total Air Passenger Forecasts Split by Airport

Figures 2.6 and 2.7 illustrate our projected Base Case distribution of total annual air passengers between Podgorica and Tivat over the forecast period. The detailed passenger and aircraft movement forecasts for each airport are presented in Sections 2.3.3.

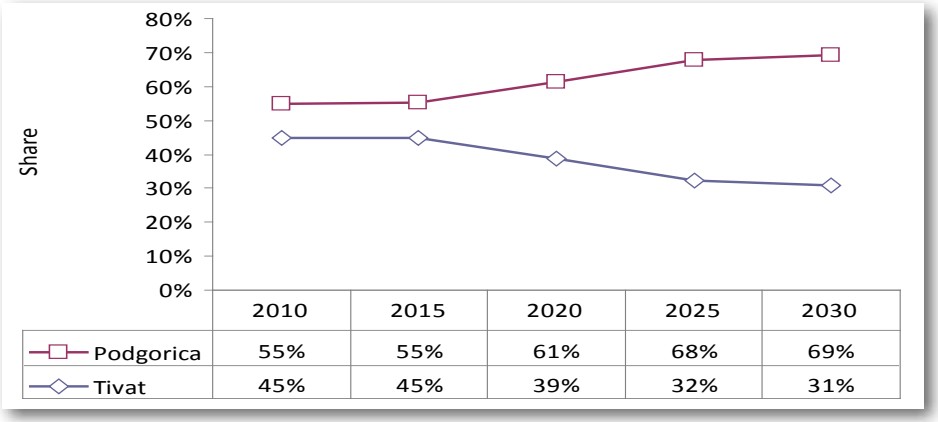
Figure 2.6: Projected Distribution (% share) of Air Passengers between Podgorica and Tiva



	2010	2015	2020	2025	2030
Podgorica	648	1,136	1,898	2,883	3,220
Tivat	540	919	1,202	1,372	1,431

Source: Halcrow forecasts.

Figure 2.7: Projected Distribution of Passengers Between Podgorica and Tivat



	2010	2015	2020	2025	2030
Podgorica	55%	55%	61%	68%	69%
Tivat	45%	45%	39%	32%	31%

Source: Halcrow forecasts.

The 2003 Airport Master Plan assumed that Podgorica would capture 70 percent of total passengers from 2020 onwards but did not offer any detailed argument in support of this figure.

2.3.3 Planning and Design Criterion for Master Planning Purposes

Airport capacity is generally defined across two dimensions: the number of passengers and aircraft movements. At a macro level, both are often referred to in annual throughput terms (e.g. Million passengers per annum). The planning and design of critical airport infrastructure is, in turn, driven by these two areas, albeit at a micro level, although estimates of passenger related capacity are meaningful only when they are referenced to the service level provided.

It is therefore important for planning and design purposes to be clear about what criterion are assumed for passengers, aircraft movements and aircraft stands. There are a number of options available. The 'peak hour' typically represents the absolute peak of activity experienced in the year, expressed either as the highest number of passengers, or ATMs, flowing through the facility in the period of an hour.

An alternative approach is the application of a 'design hour' (sometimes referred to as the 'design busy hour'). The design hour is a lesser number than the peak, and is typically taken as the 30th busy hour or the 95th percentile busy hour. For passenger terminal facilities it is common to use the 30th busy hour on the presumption that there will be 30 hours during the year in which the target level of service will not be reached. This is taken to represent the most cost-effective compromise[7] .

For runways, aircraft stands and other ATM driven infrastructure, the peak hour is generally recognised as the more appropriate measure to assess and present current, and forecast, demand requirements. This is on the basis that it is physically difficult to accommodate more aircraft than it is to process more passengers through corresponding airport infrastructure. For the purpose of this AMP and for the numbers presented in this document we use 'design hour' criteria for passenger related facilities and 'peak hour' for aircraft movement related facilities. We have presented both one and two way flows for comparison purposes.

7 Designing passenger facilities to provide the target level of service during the design hour rather than the absolute peak hour of operations represents a cost-effective compromise between congestion and the cost of meeting a level of demand that may only be experienced once a year.

2.3.4 Podgorica Airport

Annual Passengers

Annual passengers at Podgorica Airport are forecast to increase from 451,000 in 2009 to 1.14 million in 2015, 2.9 million in 2025 and 3.2 million in 2030. The average annual growth rate ranges from 14.5 percent (2011-15) to 1.7 percent (2031-35): the average annual increase for the forecast period as a whole is 7.2 percent.

Details of the Low, Base Case and High annual passenger forecasts are set out in Table 2.4.

Table 2.4: Unconstrained Annual Air Passenger Forecasts at Podgorica Airport

Year	2009	2010	2015	2020	2025	2030
Annual Passengers ('000)						
Low	451	578	953	1,389	1,883	2,421
Base case	451	578	1,136	1,898	2,883	3,220
High	451	578	1,554	3,241	3,712	4,178
Period		2011-15	2016-20	2021-25	2026-30	2031-35
Average Annual Growth						
Low		10.5%	7.8%	6.3%	5.2%	1.5%
Base case		14.5%	10.8%	8.7%	2.2%	1.7%
High		21.9%	15.8%	2.7%	2.4%	2.0%

Note: The figures for 2009 are 'actuals'. The figures for 2010 are unconstrained forecasts and differ from the actual estimated outturn due to the existing capacity constraint at Tivat.

Source: Halcrow forecast.

Annual ATMs

The average number of passengers per passenger air transport movement is projected to increase from 51 in 2009 to 111 in 2030. This reflects an increase in average seating capacity from 111 to 144 and a corresponding increase in average seat load factor from 46 percent to 78 percent. On this basis, annual passenger air transport movements are forecast to increase from 8,918 in 2009 to 28,936 in 2030, equivalent to an average annual increase of 1.5 percent.

Details of the Low, Base Case and High annual passenger ATM forecasts are set out in Table 2.5.

Table 2.6 summarises projected annual passenger air transport movements by category, wide-bodied, narrow-bodied, turboprop etc.

Podgorica Airport GSE equipment

Table 2.5: Forecast Unconstrained Annual Passenger Air Transport Movements at Podgorica

Year	2009	2010	2015	2020	2025	2030
Annual Passengers ('000)						
Low	451	578	953	1,389	1,883	2,421
Base case	451	578	1,136	1,898	2,883	3,220
High	451	578	1,554	3,241	3,712	4,178
Average Seats per Air Transport Movement						
Low	111	118	126	134	138	141
Base case	111	118	130	138	142	143
High	111	118	135	143	144	145
Average Seat Load Factor						
Low	46%	49%	61%	68%	73%	75%
Base case	46%	49%	65%	73%	77%	78%
High	46%	49%	70%	78%	79%	79%
Average Passengers Per Air Transport Movement						
Low	51	57	77	91	100	106
Base case	51	57	84	101	109	111
High	51	57	95	111	113	115
Annual Air Transport Movements						
Low	8,918	10,062	12,418	15,190	18,758	22,811
Base case	8,918	10,062	13,502	18,868	26,344	28,936
High	8,918	10,062	16,355	29,100	32,741	36,355
Period		2011-15	2016-20	2021-2025	2026-30	2031-35
Average Annual Growth						
Low		4.3%	4.1%	4.3%	4.0%	1.2%
Base case		6.1%	6.9%	6.9%	1.9%	1.5%
High		10.2%	12.2%	2.4%	2.1%	1.8%

Note: The figures for 2009 are actuals. The figures for 2010 are unconstrained forecasts and differ from the actual estimated outturn due to the existing capacity constraint at Tivat.
Source: Halcrow forecast.

Table 2.6: Forecast Annual Unconstrained Passenger Air Transport Movements at Podgorica Airport by Category

Year	Seats	Aircraft Type	2010	2015	2020	2025	2030
Low Forecast							
Mid WB	300	B762/763/IL86	108	259	460	670	893
Large NB	220	B757/Tu214	594	1,145	1,872	2,645	3,471
Medium NB	165	A319/B738	2,151	3,046	4,174	5,472	6,896
Small NB	110	ARV/E192/F100	4,899	5,245	5,497	6,138	6,970
Large Turboprop	60	ATR/CRJ	2,257	2,681	3,160	3,818	4,579
Small Turboprop	19	E120	53	43	26	14	4
Total			10,062	12,418	15,190	18,758	22,811
Base Case							
Medium WB	300	B762/763/IL86	124	404	790	1,263	1,422
Large NB	220	B757/Tu214	596	1,467	2,682	4,194	4,706
Medium NB	165	A319/B738	2,085	3,288	5,060	7,396	8,196
Small NB	110	ARV/E192/F100	4,940	5,425	6,440	8,179	8,804
Large Turboprop	60	ATR/CRJ	2,263	2,879	3,875	5,305	5,803
Small Turboprop	19	E120	54	39	22	8	3
Total			10,062	13,502	18,868	26,344	28,936
High Forecast							
Mid WB	300	B762/763/IL86	141	711	1,643	1,898	2,150
Large NB	220	B757/Tu214	604	2,185	4,834	5,563	6,283
Medium NB	165	A319/B738	2,031	3,962	7,570	8,585	9,591
Small NB	110	ARV/E192/F100	4,965	6,046	9,165	10,103	11,040
Large Turboprop	60	ATR/CRJ	2,266	3,419	5,877	6,585	7,288
Small Turboprop	19	E120	55	32	12	8	4
Total			10,062	16,355	29,100	32,741	36,355

Source: Halcrow forecast.

2.3.5 Planning Forecasts

Hourly Passengers

One-way design hour passenger throughput at Podgorica Airport are forecast to increase from 500 in 2010 to 710 in 2015, 1,190 in 2025 and 1,270 in 2030. Corresponding two-way movements are forecast to increase from 800 in 2010 to 1,510 in 2015, 2,030 in 2025 and 2,030 in 2030. Peak hour movements are projected to be some 30 percent higher in each case.

Details of the Low, Base Case and High peak and design hour air passenger movement forecasts are set out in Table 2.7.

Hourly Passenger ATMs

Two-way peak hour passenger air transport movements are forecast to increase from 11 in 2010 to 13 in 2015, 22 in 2025 and 23 in 2030.

Details of the Low, Base Case and High peak and design hour passenger ATM forecasts are set out in Table 2.8.

Aircraft Stand Demand

The number of aircraft stands required at Podgorica Airport is forecast to increase from 7 in 2010 to 8 in 2015, 14 in 2025 and 15 in 2030.

Table 2.9 summarises the projected number of stands by ICAO category for the Base Case.

Table 2.7: Unconstrained Design Period Passenger Forecasts at Podgorica

Year	2010	2015	2020	2025	2030
Design Hour One-Way Passengers					
Low Forecast	500	635	790	940	1,075
Base Case	500	710	940	1,190	1,270
High Forecast	500	865	1,290	1,405	1,500
Design Hour Two-Way Passengers					
Low Forecast	800	1,015	1,260	1,510	1,725
Base Case	800	1,140	1,510	1,910	2,030
High Forecast	800	1,385	2,060	2,245	2,400
Peak Hour One-Way Passengers					
Low Forecast	650	825	1,025	1,225	1,400
Base Case	650	925	1,225	1,550	1,650
High Forecast	650	1,125	1,675	1,825	1,950
Peak Hour Two-Way Passengers					
Low Forecast	1,040	1,320	1,640	1,960	2,240
Base Case	1,040	1,480	1,960	2,480	2,640
High Forecast	1,040	1,800	2,680	2,920	3,120

Source: Halcrow forecast.

The hourly passenger demand forecasts illustrated in Table 2.7 is based upon information provided by APM, showing representative peak hour data for 2007, 2008 and 2009. This information showed one-way peak hour passenger movements of 610 on 18th Aug 2007; 556, 573, 544 and 526 on 9th August 2008; and 409 on 1st August 2009 (annual passenger throughput fell substantially in 2009). Based on this data and the projected growth in annual passenger throughput between 2008 and 2010, Halcrow assessed the likely one-way peak hour passenger flow in 2010 to be 650.

Using our experience of other comparable airports, peak hour passenger movements were assumed to be 30 percent higher than design hour passenger movements and two-way flows were assumed to be 1.6 times the equivalent peak or design hour one-way flow.

APM subsequently provided further data which lists arriving, departing and two-way passenger movements for the 30 busiest hours (in terms of two-way passenger movements) in 2010 to date.

The data provided by APM for 2010 identifies a peak hour two-way passenger flow of 694 on 21st August 2010. The 30th busiest two-way passenger flow is 432 on 15th May 2010, which indicates a ratio between peak and design hour flows of 1.6. (higher than the 1.3 assumed by Halcrow). The one-way peak hour passenger flow is the 502 departing passengers recorded on 27th August 2010. This indicates a ratio of one-way to two-way flows of 1.38 (694/502), which is lower than the ratio of 1.6 assumed by Halcrow.

Although the data for 2010 is incomplete and yet to be ratified it does raise certain matters for strategic consideration. Firstly, whilst peak hour traffic at Podgorica in 2010 is definitely showing signs of recovery, it has yet to return to the levels seen during 2007 or 2008. This may be as a consequence of those markets which previously operated Code D aircraft taking longer to recover from the economic down-turn. It therefore remains a matter of conjecture whether the data for 2010 is judged to accurately represent the stable pattern of traffic at Podgorica. Based on our analysis of the data provided, we still believe strong growth will return within the next five years as predicted. We also believe that when this growth returns there will be consequential impact on the lead in times required for terminal, stand and airport related capacity provision in general.

Table 2.8: Forecast Unconstrained Passenger Air Transport Movements at Podgorica[8]

Year	2010	2015	2020	2025	2030
Design Hour One-Way ATMs					
Low Forecast	5	6	7	8	10
Base Case	5	6	8	11	11
High Forecast	5	7	12	13	14
Design Hour Two-Way ATMs					
Low Forecast	8	10	12	13	15
Base Case	8	10	13	17	18
High Forecast	8	12	18	20	22
Peak Hour One-Way ATMs					
Low Forecast	7	8	9	11	13
Base Case	7	8	11	14	15
High Forecast	7	9	15	16	18
Peak Hour Two-Way ATMs					
Low Forecast	11	13	15	17	20
Base Case	11	13	17	22	23
High Forecast	11	15	24	26	29

Note: The data provided for the Year 2010 is based on forecast figures rather actual statistical data

Source: Halcrow forecast.

8 Runway capacity is often defined with reference to sustained peak hourly throughput rather than the absolute peak demand in the busiest hour of the year. Providing one-way and two way flows indicates the balance of movements by direction (inbound/outbound and vice versa), which affects average runway occupancy. We would normally plan total stand demand to accommodate peak hour traffic. Design hour stand demand and the ratio of peak to design hour demand, can inform the split between jetty airbridge-served and remote stands where appropriate.

Table 2.9: Forecast[9] Unconstrained Aircraft Stand Demand at Podgorica Airport

Category	2010	2015	2020	2025	2030
Code D	3	3	4	6	6
Code C	4	5	7	8	9
Total	7	8	11	14	15

Source: Halcrow forecast.

Code D (IL-86 and Tu-154) aircraft contributed significantly to peak hour passenger flows over the period 2007-2009 for which peak hour data was provided during the course of the traffic analysis. The reduction in Code D aircraft movements observed in 2010 appears to have reduced the overall volume of peak hour one-way passenger flows.

Halcrow's Interim Report presents projections of aircraft stand demand designed to inform the preparation of a long-term strategic master plan for Podgorica Airport based on the existing pattern of traffic and likely future trends.

Further work is required to establish whether the substantial reduction in the share of movements by Code D aircraft is judged to be permanent, rather than a reflection of a hiatus in the development of Podgorica's tourist-oriented charter traffic. If it transpires that this is the case, then the corresponding forecasts together with Table 2.9 would need to be updated. At this point in time, there is insufficient evidence to make such an absolute decision.

2.3.6 Tivat Airport

Annual Passengers

Annual passengers at Tivat Airport are forecast to increase from 532,000 in 2009 to 919,000 in 2015, 1.37 million in 2025 and 1.43 million in 2030. The average annual growth rate ranges from 10.7 percent (2010-15) to 0.4 percent (2030-35): the average annual increase for the forecast period as a whole is 4.0 percent.

Details of the Low, Base Case and High annual passenger forecasts are set out in Table 2.10.

9 Table 3.7 is based on the base case forecasts. As explained in paragraph 2.12.5 the high forecasts "sole purpose is to indicate the scale of airport facilities required to support the tourism development strategy if it were to proceed on schedule; the forecast exceeds our assessment of the upper bound of likely outcomes." If traffic were to grow at a feasibly higher growth rate than the base case forecast assumes, the need for the facilities defined for the base case would be brought forward by one year (from 2020 to 2019), four years (2025 to 2021) and seven years (from 2030 to 2023).

Annual ATMs

The average number of passengers per passenger air transport movement is projected to increase from 76 in 2009 to 123 in 2030. This reflects an increase in average seating capacity from 119 to 154 and a corresponding increase in average seat load factor from 64 percent to 81 percent. On this basis, annual passenger air transport movements are forecast to increase from 6,988 in 2009 to 11,618 in 2030, equivalent to an average annual increase of 2.0 percent.

Details of the Low, Base Case and High annual passenger ATM forecasts are set out in Table 2.11.

Table 2.12 summarises the projected composition of annual passenger air transport movements by category, wide-bodied, narrow-bodied, turboprop etc.

Table 2.10: Unconstrained Annual Air Passenger Forecasts at Tivat Airport

Year	2009	2010	2015	2020	2025	2030
Annual Passengers ('000)						
Low	532	540	797	977	1,091	1,138
Base case	532	540	919	1,202	1,372	1,431
High	532	540	1,172	1,625	1,699	1,738
Period		2011-15	2016-20	2021-2025	2026-30	2031-35
Average Annual Growth						
Low		7.6%	4.2%	2.2%	0.8%	0.8%
Base case		10.7%	5.5%	2.7%	0.9%	0.4%
High		16.2%	6.8%	0.9%	0.5%	0.0%

Note: The figures for 2009 are actuals. The figures for 2010 are unconstrained forecasts and differ from the actual estimated outturn due to the existing capacity constraint at Tivat.

Source: Halcrow forecast.

Table 2.11: Forecast Unconstrained Annual Passenger Air Transport Movements at Tivat

Year	2009*	2010*	2015	2020	2025	2030
Annual Passengers ('000)						
Low	532	540	797	977	1,091	1,138
Commercial Traffic	527	535	789	967	1,080	1,127
General Aviation	5	5	8	10	11	11
Base case	532	540	919	1,202	1,372	1,431
Commercial Traffic	527	535	910	1,190	1,358	1,417
General Aviation	5	5	9	12	14	14
High	532	540	1,172	1,625	1,699	1,738
Commercial Traffic	527	535	1,160	1,609	1,682	1,721
General Aviation	5	5	12	16	17	17
Average Seats per Air Transport Movement						
Low	119	122	136	143	147	148
Base case	119	122	141	149	152	153
High	119	122	149	156	157	157
Average Seat Load Factor						
Low	64%	66%	73%	76%	77%	78%
Base case	64%	66%	75%	78%	80%	80%
High	64%	66%	78%	81%	82%	82%
Average Passengers Per Air Transport Movement						
Low	76	80	99	109	113	115
Base case	76	80	106	117	122	123
High	76	80	116	127	128	129
Annual Air Transport Movements						
Low	6,988	6,887	8,057	8,989	9,625	9,893
Commercial Traffic	5,590	5,510	6,446	7,191	7,700	7,914
General Aviation	1,398	1,377	1,611	1,798	1,925	1,979
Base case	6,988	6,887	8,678	10,259	11,262	11,618
Commercial Traffic	5,590	5,510	6,942	8,207	9,010	9,294
General Aviation	1,398	1,377	1,736	2,052	2,252	2,324
High	6,988	6,887	10,088	12,788	13,236	13,477
Commercial Traffic	5,590	5,510	8,070	10,230	10,589	10,782
General Aviation	1,398	1,377	2,018	2,558	2,647	2,695
Period		2011-15	2016-20	2021-2025	2026-30	2031-35
Average Annual Growth						
Low		3.2%	2.2%	1.4%	0.5%	0.5%
Base case		4.7%	3.4%	1.9%	0.6%	0.3%
High		7.9%	4.9%	0.7%	0.4%	0.0%

* Note: The figures for 2009 are actuals. The figures for 2010 are unconstrained forecasts and differ from the actual estimated outturn due to the existing capacity constraint at Tivat. General Aviation traffic is maintained at a constant 1% of the total passenger volume and 20% of total Air Transport Movements

Source: Halcrow forecast.

Table 2.12: Forecast Annual Unconstrained Passenger Air Transport Movements at Tivat Airport

Year	Seats	Aircraft Type	2010	2015	2020	2025	2030
Low Forecast							
Mid WB	300	B762/763/IL86	43	126	188	224	240
Large NB	220	B757/Tu214	93	556	903	1,106	1,194
Medium NB	165	A319/B738	1,925	3,037	3,882	4,402	4,624
Small NB	110	ARV/E192/F100	3,654	3,148	2,803	2,650	2,581
Large Turboprop	60	ATR/CRJ	1,172	1,190	1,213	1,242	1,254
Small Turboprop	19	E120	0	0	0	0	0
Total			6,887	8,057	8,989	9,625	9,893
Base Case							
Medium WB	300	B762/763/IL86	71	298	454	544	575
Large NB	220	B757/Tu214	179	877	1,355	1,629	1,723
Medium NB	165	A319/B738	2,017	3,235	4,164	4,721	4,916
Small NB	110	ARV/E192/F100	3,476	3,043	2,943	2,940	2,945
Large Turboprop	60	ATR/CRJ	1,143	1,225	1,343	1,428	1,459
Small Turboprop	19	E120	0	0	0	0	0
Total			6,887	8,678	10,259	11,262	11,618
High Forecast							
Mid WB	300	B762/763/IL86	83	600	930	983	1,010
Large NB	220	B757/Tu214	186	1,398	2,170	2,292	2,358
Medium NB	165	A319/B738	1,980	3,566	4,755	4,949	5,053
Small NB	110	ARV/E192/F100	3,492	3,160	3,315	3,351	3,371
Large Turboprop	60	ATR/CRJ	1,146	1,364	1,617	1,661	1,685
Small Turboprop	19	E120	0	0	0	0	0
Total	0	0	6,887	10,088	12,788	13,236	13,477

Note: Tivat is currently capacity constrained. Whilst it is generally accepted that present Code D classified aircraft will be phased out of operation over the next twenty years, it remains a matter of debate whether these will be progressively replaced by aircraft of similar dimension or by Code C or 'super Code C' aircraft such as the B737-800. Although technically a Code C aircraft, the B737-800 falls on the outer limit of the ICAO classification for that code of aircraft. Based on Tivat statistics the August share of Group D aircraft was 16.3% in 2007, 11.4% n 2008 and 6.9% in 2009. Tivat has been capacity constrained in the past two or three years. The forecasts presented in the Interim Report are unconstrained and reflect the pre-constraint mix of aircraft (2007).

Source: Halcrow forecast

2.3.7 Planning Forecasts

Hourly Passengers

One-way design hour passenger throughput at Tivat Airport are forecast[10] to increase from 575 in 2010 to 730 in 2015, 905 in 2025 and 925 in 2030[11]. Corresponding two-way movements are forecast to increase from 925 in 2009 to 1,355 in 2015, 1,445 in 2025 and 1,475 in 2030. Peak hour movements are projected to be some 30 percent higher in each case[12].

Details of the Low, Base Case and High peak and design hour air passenger forecasts are set out in Table 2.13.

Hourly Passenger ATMs

Two-way peak hour passenger air transport movements are forecast to increase from 12 in 2009 to 13 in 2015, 15 in 2025 and 15 in 2030.

Details of the Low, Base Case and High peak and design hour passenger ATM forecasts are set out in Table 2.14.

Aircraft Stand Demand

The number of aircraft stands required at Tivat Airport is forecast to increase from 13 in 2010 to 16 in 2015, 17 in 2025 and 17 in 2030.

Table 2.15 summarises the projected number of stands by ICAO category and for GA for the Base Case.

Table 2.13: Unconstrained Design Period Passenger Forecasts at Tivat

Year	2010	2015	2020	2025	2030
Design Hour One-Way Passengers					
Low Forecast	575	675	750	790	810
Base Case	575	730	845	905	925
High Forecast	575	845	980	1,000	1,020
Design Hour Two-Way Passengers					
Low Forecast	925	1,075	1,200	1,260	1,290
Base Case	925	1,170	1,355	1,445	1,475
High Forecast	925	1,355	1,570	1,600	1,630
Peak Hour One-Way Passengers					
Low Forecast	750	875	975	1,025	1,050
Base Case	750	950	1,100	1,175	1,200
High Forecast	750	1,100	1,275	1,300	1,325
Peak Hour Two-Way Passengers					
Low Forecast	1,200	1,400	1,560	1,640	1,680
Base Case	1,200	1,520	1,760	1,880	1,920
High Forecast	1,200	1,720	2,040	2,080	2,120

Source: Halcrow forecast

10 Source data for 2007, 2008 and 2009 was provided by Tivat Airport (Peak daily and peak hourly passenger flows).

11 The 575 and 925 passengers per hour quoted above are design hour flows and are intended to represent the typical busy hour (30th busiest hour of the year). Absolute peak hourly passenger flows are assumed to be 30 percent higher (750 one-way/1200 two-way in 2010).

12 Peak and design hour flow forecasts acknowledge the projected growth in annual passenger throughput and the tendency for the ratio of peak to annual flows to decline slowly over time. The long-term relationship between peak and annual passenger flows is based on Halcrow's experience of other similarly sized airports.

Table 2.14: Forecast Unconstrained Peak Design Period Passenger Air Transport Movements at Tivat

Year	2010*	2015	2020	2025	2030
Design Hour One-Way ATMs					
Low Forecast	6	6	6	7	7
Base Case	6	6	7	7	7
High Forecast	6	7	8	8	8
Design Hour Two-Way ATMs					
Low Forecast	9	10	10	11	11
Base Case	9	10	11	12	12
High Forecast	9	11	12	12	12
Peak Hour One-Way ATMs					
Low Forecast	8	8	8	9	9
Base Case	8	8	9	9	9
High Forecast	8	9	10	10	10
Peak Hour Two-Way ATMs					
Low Forecast	12	13	13	14	14
Base Case	12	13	14	15	15
High Forecast	12	14	16	16	16

*Note: The data provided for the Year 2010 is based on forecast figures rather actual statistical data.

Source: Halcrow forecast

Table 2.15: Forecast[13] Unconstrained Aircraft Stand Demand at Tivat Airport

Category	2010	2015	2020	2025	2030
Code D	2	2	2	3	4
Code C	5	6	7	6	5
GA14*	6	8	8	8	8
Total	13	16	17	17	17

Source: Halcrow forecast

Discussion of Traffic Risks

There are three main areas of traffic risk, comprising:

- The rate and scale of tourism development;
- Operational constraints at Tivat Airport; and
- Risks related to lack of survey data.

Rate and Scale of Tourism Development

Podgorica and Tivat are relatively small airports at an early stage in their development. With a Montenegrin population of just 0.6 million, their future growth depends almost entirely upon the successful implementation of the country's Tourism Development Strategy. Understandably, the strategy focuses on the provision and staffing of new hotels capable of attracting an international clientele, but the tourism and aviation sectors are mutually dependent. The airports at Podgorica and Tivat form an integral part of the country's tourism infrastructure and failure to achieve the tourism sector's stated targets would translate directly into lower airport throughput.

We are not aware of any more detailed analysis of Montenegro's plans for the future development of tourism than is presented in the 2008 Tourism Development Strategy (see section 4.1.1). Information on the medium-term phasing of tourism development, its proposed geographical distribution across Montenegro, the location of target markets and the expected impact of the current economic crisis all have an important bearing on the relative roles and required scale of facilities at the country's two main airports. We

13 Base Case (Medium growth) forecast. N.B. As explained in paragraph 2.11.5 the high forecasts "sole purpose is to indicate the scale of airport facilities required to support the tourism development strategy if it were to proceed on schedule; the forecast exceeds our assessment of the upper bound of likely outcomes." If traffic were grow at a feasibly higher growth rate than the base case forecast assumes, the need for the facilities defined for the base case would be brought forward by one year (from 2020 to 2019), four years (2025 to 2021) and seven years (from 2030 to 2023).

* Until such time sufficient GA vs. commercial traffic peak day/hour data is made available, GA peak stand demand is assumed to represent 20% of the corresponding commercial stand demand over and above the existing GA stand provision

have assumed that achievement of the target number of visitor beds and visitor nights originally specified by 2001 Tourism Master Plan will be achieved in 2025 rather than 2020 but it is beyond the scope of this study to entirely recast Montenegro's tourism forecasts in the light of the events of the past ten years. Ideally, the tourism development strategy will be updated and elaborated in more detail before significant investment is committed to either airport.

Data Risks

The forecasts presented in this AMP are built up from a series of interlocking data and assumptions. Some of these assumptions are built on firmer foundations than others. Key assumptions such as the existing proportion of foreign visitors arriving in Montenegro by air exert a powerful influence over the volume of forecast air passenger movements in the future but we are not aware of any data defining this important parameter. This type of information may already be collected at border points. If so, there would be significant benefit to be gained from it being added to the set of routinely published tourism statistics.

Similarly, we were unable to find any data that defines the current composition of the air passenger market at Podgorica and Tivat in terms of residence (visiting/resident) or journey purpose (business/leisure/VFR). This type of information can normally only be obtained by personal interview surveys of air passengers. The results of a formal interview survey of passengers departing Podgorica and Tivat would be advantageous in permitting the future refinement of traffic forecasts for detailed business and planning purposes.

2.4 Review of Podgorica and Tivat Airport

2.4.1 Existing facilities and operations

A detailed pavement inspection has not been undertaken for the two airports, however the pavement strengths reported in the AIPs are appropriate for the existing and anticipated aircraft loads and there are no known issues relating to condition or serviceability.

Podgorica Airport

Podgorica airport has a single runway which is 2,500m in length long and oriented in the 18/36 direction. The runway is 45m wide without paved shoulders and is constructed in asphalt.

The taxiways at Podgorica airport are, for the most part, 15m wide. Almost all taxiways are constructed with flexible asphalt surfacing, except for Taxiway Papa that is rigid concrete structure. Taxiways Hotel, Juliet, Kilo and Lima makes up a full length parallel taxiway. It is 15m wide throughout and is, in accordance with ICAO Standards and Recommended Practices (SARPS), not compliant for operations by larger code C and all Code D aircraft. Link taxiways Alpha, Bravo and Foxtrot are located to either end of the runway and are adequately sized for large Code C and Code D operations.

The apron at Podgorica aerodrome has six Code C stands just in front of the terminal. The apron pavement is rigid concrete and the configuration of the stands is power-in/-out. Passengers are either bussed or required to walk between the parked aircraft and the terminal.

Podgorica Airport has benefitted from well-timed capital investment with the construction of a new, well planned and effective passenger terminal which is still operating well within target LOS.

Podgorica Airport: Check-in Desks/Concourse

The footprint of the existing terminal is approximately 5,500m^2, providing around 14m^2 per passenger during the busiest times during 2010. The terminal is positioned just behind the apron providing easy access to and from the aircraft.

Airports of Montenegro (APM) are based in the old terminal building, in line with and just south of the existing terminal. Maintenance crew and staff are also based in the old terminal as there is no stand alone GSE maintenance base. A VIP and VVIP terminal occupies the southern part of the old terminal.

Podgorica Airport: GSE repair 'base'

The fuelling station is rudimentary and lacks dedicated facilities for garaging and additional services. Aviation fuel is currently transported with fuel trucks from the fuel farm located just south of the terminal. The current system of refuelling aircraft with fuel bowsers is deemed adequate and suitable for the operations at Podgorica.

Podgorica Airport: 'Fuel Farm'

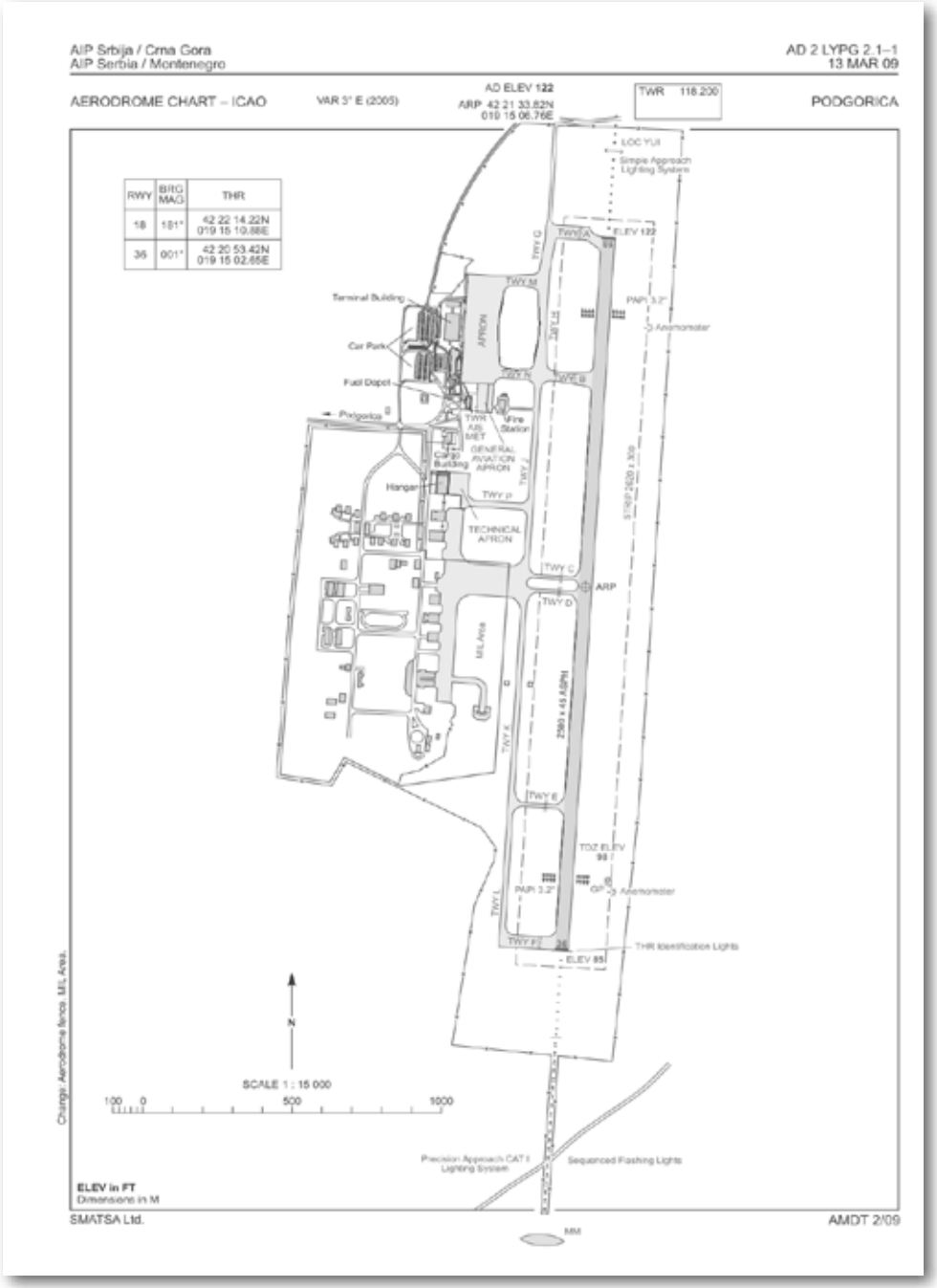
The air traffic control (ATC) operations base and tower is positioned south of the apron in a relatively new control tower. The fire station is located east of the ATC with direct link to Taxiway Juliet. The existing general aviation (GA) operation is positioned in between the ATC and the fire station and the southern edge of the GA apron is used for GSE actives.

The cargo facilities are located south of the fuelling station and the main landside access road. The building is located on the landside/airside boundary providing air cargo service to Montenegro. The volume is likely to increase and the facilities need to expand accordingly in the longer term.

The remote technical apron areas are accessed from taxiway Papa, providing approximately 18,000m^2 apron areas. Three hangars are positioned along the western edge of the technical apron areas; these are used by both private and national companies such as Montenegro Airlines.

The remaining remote apron area and buildings / hangars are used by the military and Figure 2.8 is an extract from the AIP for Podgorica, which provides a schematic interpretation of the existing aerodrome layout.

Figure 2.8: AIP Extract for Podgorica Airport



The airport is accessed via the road to the city of Podgorica and there is car parking west of the terminal building.

Tivat Airport

A general layout of the existing airport is shown in Figure 2.9, extracted from the airport AIP.

Tivat Airport is served by a single, Code D/E, asphalt paved runway, designation 14-32, with a length of 2,500m and width of 45m. The predominant runway in use for both approaches and departures is 32.

Tivat Airport: Runway 14/32 in good state of repair and maintenance

All passenger processing and operational support facilities are located in the northeast of the airport site, in a plot bordered by the apron to the west, the Tivat – Budva Highway to the east and a land drain and Ostrvo Cvijeca Road to the North.

The passenger apron is approximately 25,000m^2 with self manoeuvre parking for six Code C and one Code D aircraft. The apron is of asphalt construction and is accessed by Taxiway Alpha adjacent to threshold 14 and Taxiway

Bravo at the southern end of the apron. The taxiway widths are 25m and 20m respectively. No passenger boarding bridges are provided and all passengers must walk or be bussed to and from the terminal building.

The runway and Taxiways Alpha and Bravo do not have shoulders, which is non-compliant with the requirements of the ICAO Annex 14 for the code of aircraft operating.

A GA apron is located to the south of the main passenger apron and Taxiway Bravo. The apron is served by a dedicated GA taxilane and provides six drive through parking stands.

The terminal at Tivat was completely refurbished in 2006 and has a total internal area of approximately 4,050m^2. Based on international standards this is under-sized for the busy hour passenger throughput.

Tivat Airport: Check-in Desks/Concourse

Discussion with Tivat Airport staff confirmed that the Terminal building lacks capacity during busy periods.

Tivat Airport: Baggage Reclaim Hall – well maintained and recently developed (2006) but with reduced LOS during busy periods

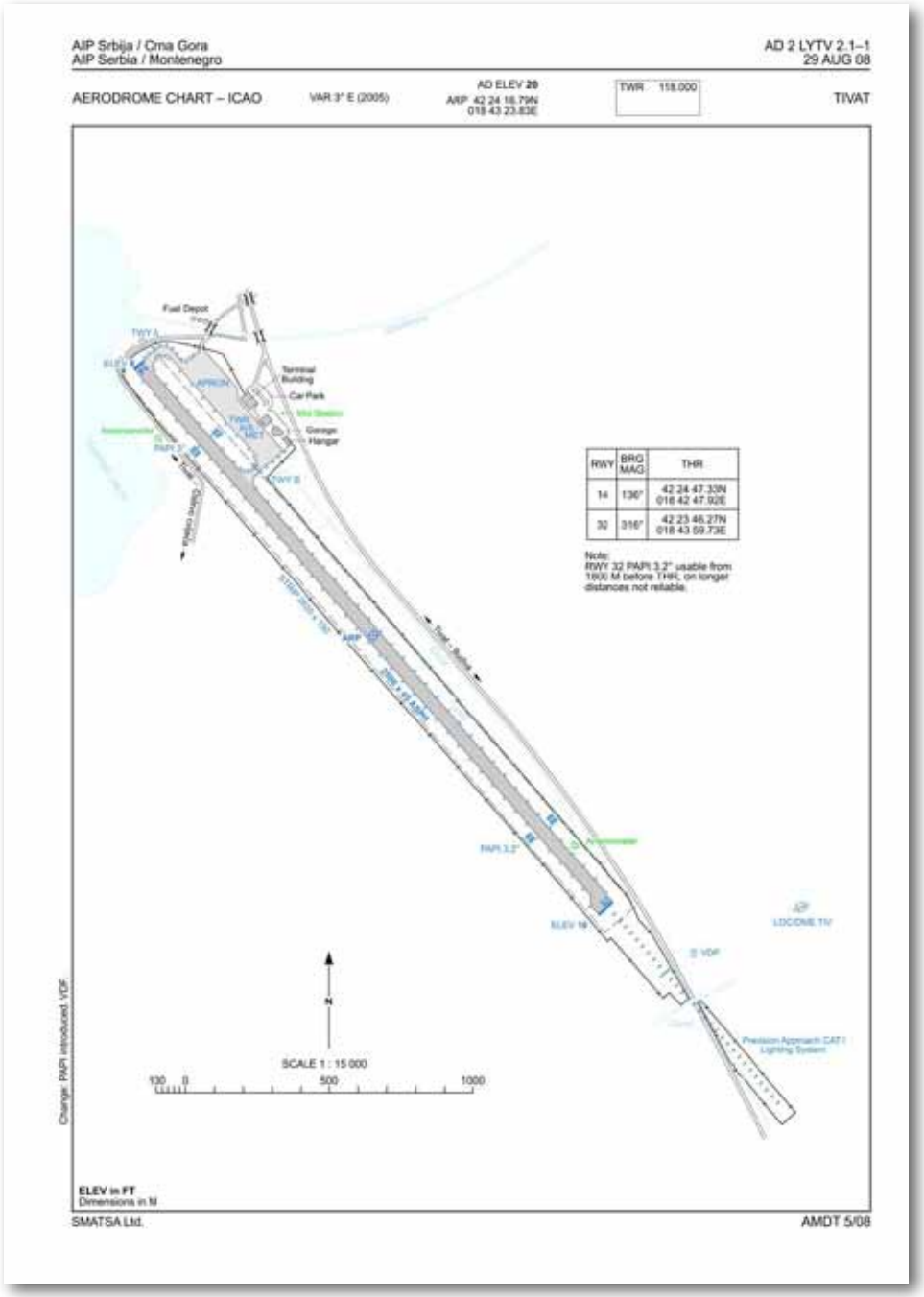
Access to the airport is directly from the E65/E80 Tivat-Budvah highway. Passenger and staff parking are provided to the front of the terminal.

Aircraft refuelling is undertaken by bowser with vehicles loading at the Jugopetrol operated fuel farm to the north east of the terminal area outside of the airport boundary.

Figure 2.9: AIP Extract for Tivat Airport (opposite)

Air traffic control (ATC) is located in a tower to the immediate south of the terminal building, adjacent to the main passenger apron. The tower is functional and appears of similar condition and vintage to the adjacent buildings and is understood to penetrate the runway transitional surface.

The airport fire station is located just south of the tower in direct connection with the apron. The facilities are in a relatively poor condition and are considered to be in need of upgrade and/or refurbishment.



Tivat Airport: Fire Station

A hangar/maintenance building is located to the south of the fire station

2.4.2 Capacity analysis

Podgorica Airport

Podgorica Airport handled 451,000 passengers in 2009 and over 640,000 in 2010[14].

Montenegro Airlines and Serbia's Jat Airlines accounted for 54 percent and 19 percent of Podgorica's total air passengers respectively in 2009. Other important carriers include Adria Airways, Austrian Airlines and Malev.

Belgrade and Moscow are the two main destinations served from Podgorica and generated 44 percent and 11 percent of total passengers respectively in 2009. Other destinations generating more than 20,000 passenger movements in 2009 included Frankfurt, Ljubljana and Vienna.

The average number of passengers per air transport movement was 50 in 2009. Based on our analysis of aircraft movements by type, we estimated the average number of seats per passenger air transport movement (PATM) to have been 111. The resulting average load factor of 45 percent is low by international standards but reflects the largely scheduled nature of operations at Podgorica.

The predominant aircraft types operated into Podgorica in 2007 included Montenegro Airlines' Fokker 100, Jat Airways' ATRs and Boeing 737s and the

14 The provisional out-turn figure for 2010 is 647,530 passengers

Tupolev 154s of various CIS airlines. The similarly sized Embraer 195 has since supplemented Montenegro Airlines' Fokker 100s. The airport has handled 350-seat wide-bodied Boeing 767-30 and Ilyushin 86 aircraft in recent years.

Table 2.16: Air Passengers by Origin/Destination at Podgorica Airport in 2009

Origin/ Destination	Passengers			Share		
	2007	2008	2009	2007	2008	2009
Belgrade	242,590	258,571	199,374	53%	48%	44%
Moscow	49,151	85,777	48,031	11%	16%	11%
Vienna	25,153	32,674	34,021	6%	6%	8%
Frankfurt	26,673	31,905	26,669	6%	6%	6%
Ljubljana	16,309	18,023	20,252	4%	3%	4%
Zurich	14,425	16,627	16,481	3%	3%	4%
Budapest	9,656	14,297	13,811	2%	3%	3%
Rome	10,689	13,336	12,760	2%	2%	3%
Other	55,306	63,097	75,121	12%	12%	17%
GA	5,264	4,170	3,988	1%	1%	1%
Total	455,216	538,477	450,508	100%	100%	100%

Source: Halcrow analysis of Podgorica Airport traffic statistics.

Tivat Airport

Tivat Airport handled 532,000 passengers in 2009 and 540,000 in 2010. There is a suggestion that the airport may have been operating within a peak hour[15] airfield capacity constraint since 2007 and traffic for the first half of 2010 was lower by some three percent[16]. This will require further joint investigation with APM to establish the true extent of any current capacity constraint.

Montenegro Airlines and Serbia's Jat Airlines accounted for 44 percent and 10 percent of Tivat's total air passengers respectively in 2009. Moscovia and Sky Express accounted for nine percent and six percent and six other Russian airlines for a further 15 percent of total passenger movements in 2009.

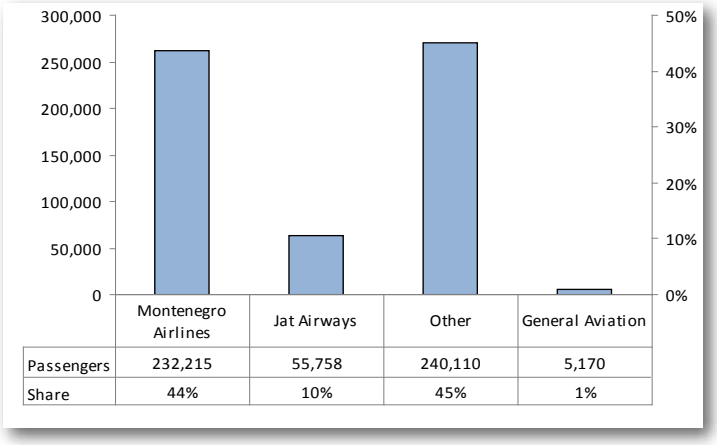
Belgrade and Moscow are the two dominant destinations.

The average number of passengers per air transport movement was 76 in 2009. We estimate the average number of seats per aircraft to have been 119. The resulting average load factor of 64 percent is relatively low but reflects the mix of scheduled and charter operations. However, due to specific annual traffic distribution at Tivat Airport, we consider that it would be more appropriate if the average number of passengers per aircraft operation during summer season is taken into consideration. Based on statistical data on the number of passengers and number of aircraft operations during summer season (July and August) the average number of passengers per aircraft operation is 93 passengers per aircraft movement. The peak hour forecasts presented in later sections take account of the higher passenger loads in peak months.

The predominant aircraft types operated into Tivat in 2009 included Montenegro Airlines' Fokker 100s and Embraer 195s, Jat Airways' ATRs and Boeing 737s and the Boeing 737s and Tupolev 154s of numerous CIS scheduled and charter airlines. In common with Podgorica, Tivat has also handled 350-seat wide-bodied Boeing 767-30 and Ilyushin 86 aircraft in recent years.

Figure 2.10 illustrates the distribution of air passengers by carrier at Tivat Airport in 2009.

Figure 2.10: Air Passengers by Carrier at Tivat Airport in 2009



Source: Halcrow analysis of Tivat Airport traffic statistics.

2.4.3 Demand vs. Capacity analysis

Podgorica Airport

The traffic at Podgorica is expected to more than double over the next 20 years and the forecast traffic and passenger numbers and the forecast stand demand is listed in Table 2.17 and Table 2.18 below.

15 The peak hour will represent the single busiest hour of normal operations during the forecast year. For certain airport facilities, such as aircraft stand demand, the peak hour would represent the most appropriate demand criteria.

16 The provisional out-turn figure for 2010 is 540,000 passengers

Table 2.17 – Traffic Forecast

	2010	2015	2020	2025	2030
Annual Passengers (Base Forecast)	648,000	1,136,000	1,898,000	2,883,000	3,220,000
Design Hour Passengers (2-way)	800	1,140	1,510	1,910	2,030
Peak ATM/hour	11	13	17	22	23
Stands Required	7	8	11	14	15

Source: Halcrow analysis

Table 2.18 – Forecast Unconstrained Aircraft Stand Demand at Podgorica Airport[17]

Category	2010	2015	2020	2025	2030
Code D	3	3	4	6	6
Code C	4	5	7	8	9
Total	7	8	11	14	15

Source: Halcrow analysis

Cargo

The expansion of both Podgorica and Tivat will be driven by tourism whilst the impact of cargo on the airports' development is expected to be limited. The importance of cargo is however recognised and where such aircraft movements are included, within the base traffic data, it has been assumed that traffic component remains within the projected traffic forecasts included within this report.

General Aviation

General Aviation (GA) encompasses a diverse range of definitions and activities from recreation, training and personal use to agriculture, air taxi and business use. The type of GA aircraft can also vary enormously from gliders and micro-lights to helicopters and corporate jets. One of the main components of GA is Business Aviation (BA) which typically consists of companies and individuals using aircraft as a means to conduct their commercial business. GA is considered to comprise all aircraft that are not operated by commercial aviation or by the military. APM define GA as 'small aircraft' (carrying around 3-4 people).

17 Halcrow traffic forecast; refer to Final Interim Report Airports of Montenegro Master Plan (Jan 2011) for more details

Tivat Airport

Forecasts of passenger and air traffic growth over the master plan period are described in detail in the Interim Report. 2.19 and 2.20, below, summarise the outputs of the forecast exercise and provide the fundamental design parameters on which development scale and timing is based.

Table 2.19 – Traffic Forecast

	2010	2015	2020	2025	2030
Annual Passengers (Base Forecast)	540,000	919,000	1,202,000	1,372,000	1,431,000
Design Hour Passengers (2-way)	925	1,170	1,355	1,445	1,475
Peak ATM/hour	12	13	14	15	15
Stands Required	7	8	9	9	9

Source: Halcrow analysis

Table 2.20 – Forecast Unconstrained Aircraft Stand Demand at Tivat Airport[18]

Category	2010	2015	2020	2025	2030
Code D	2	2	2	3	4
Code C	5	6	7	6	5
GA	6	8	8	8	8
Total	13	16	17	17	17

Source: Halcrow analysis

As shown in 2.19, very rapid growth is forecast in annual passenger numbers to 2015, with continued, less rapid growth going forward to the end of the forecast period.

Whilst the annual passenger figures are relevant, airport planning is based on the design hour passenger throughput and peak hour ATM figures for terminal and airside infrastructure respectively. The growth in these figures is not proportional to the growth in annual passengers. This is a feature of the spreading of the peak throughout the busy day, week and month,

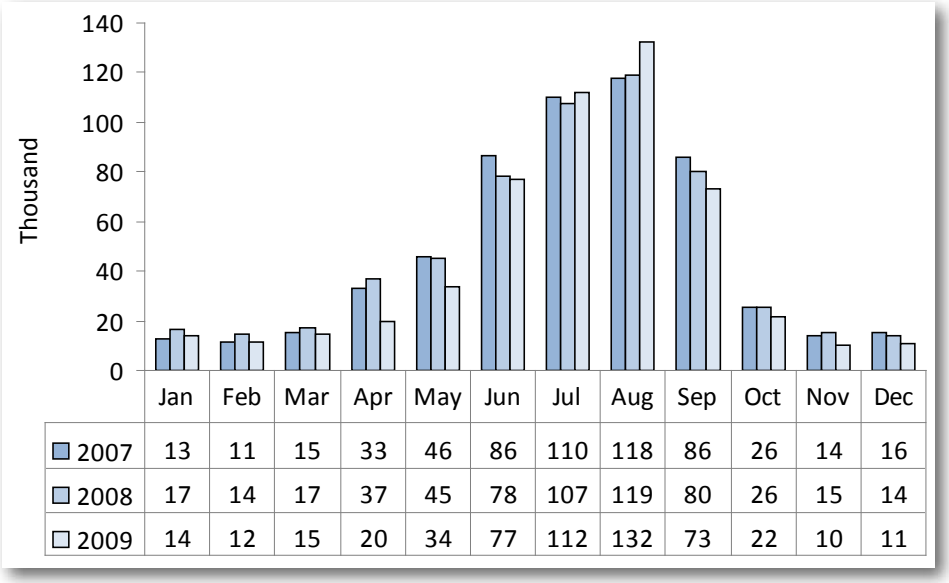
18 Halcrow traffic forecast; refer to Final Interim Report Airports of Montenegro Master Plan (Jan 2011) for more details

with additional flights being scheduled into the less busy shoulder periods where possible. This is a sensible strategic approach as it allows growth to be accommodated with minimal physical expansion and also provides a more constant utilisation of the facilities provided, rather than short intense use during the absolute peak and then an inefficient underutilisation outside of the peak.

Traffic Trends

Figure 2.11 and 2.12 show the monthly and weekly trends in passenger movements at Tivat Airport respectively. It is apparent that there is a summer peak, with 69% of the 2009 passenger movements occurring in the 4 months of June to September. Within the busiest month of this peak period, August, Saturday exhibits a major peak in the weekly traffic with over twice as many passengers being accommodated than on any other day of the week.

Figure 2.11 Monthly Air Passenger Movements at Tivat Airport 2007-2009



	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2007	13	11	15	33	46	86	110	118	86	26	14	16
2008	17	14	17	37	45	78	107	119	80	26	15	14
2009	14	12	15	20	34	77	112	132	73	22	10	11

Source: Halcrow analysis

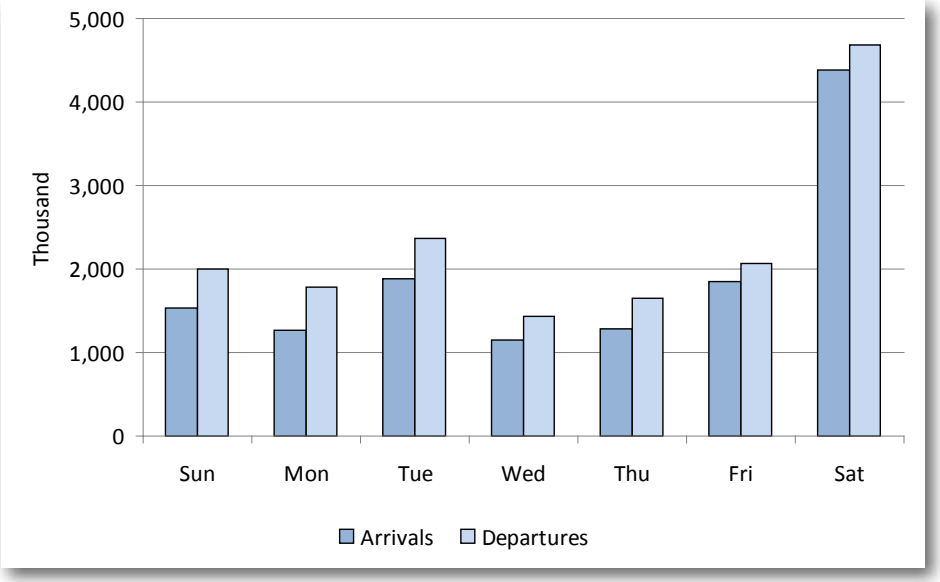
Cargo

Cargo is not of any significant size or operation at Tivat. This is unlikely to change in the foreseeable future.

General Aviation

General aviation is important to Tivat Airport and forms a considerable proportion of their traffic. Many aircraft require long term parking and we propose that GA activity is centred on the existing apron area in the north east corner of the airport. This will segregate GA from passenger operations, which are operationally desirable, and also allow existing assets to be utilised in the long term, with the existing terminal used as a GA facility. The GA apron will be self manoeuvre, with aircraft positioned to be outside of the instrument runway strip and below the transitional surface. The proximity of the existing GA stands to the runway makes them unsuitable for use once instrument operations are introduced as the aircraft on the stands would be obstacles to safeguarded surfaces.

Figure 2.12 Average Daily Passenger Movements at Tivat Airport in August 2009



Source: Halcrow analysis

2.4.4 Planning & Facility Requirements

Podgorica Airport

Runway and taxiways

In order to be compliant with ICAO SARPS 7.5m wide shoulders should be added to the runway, making the total paved width 60m. Meeting the criteria for Code D operations, this also meets the criteria for Code E, should this ever be required.

The forecast traffic listed above is unconstrained and is based on any aircraft clearing the runway using the link taxiways at the runway end and taxiing

using the parallel taxiway. The taxiway therefore needs to be widened from 15m to 23m to allow for Code D traffic, which is part of the anticipated traffic mix. In order to be ICAO SARPS compliant 7.5m shoulders needs to be added making the overall width 38m. However, in order to maximise the potential use of investment it is suggested that 10.5m shoulders (additional 3m) are added, making the taxiway compliant for Code E operations. This will enable the aerodrome to accept the occasional Code E operations.

The above recommended developments to the runway and taxiways should be initiated as soon as possible in order not to constrain traffic growth.

Apron

The stand demand forecast in Tables 2.17 and 2.18 indicates that the number of stands will need to double over the next 15 years. This will ensure that the traffic growth is not hindered from the lack of suitable stands. The expansion of apron should not be dependant on the terminal expansion and will rather be triggered by the stand demand.

Stage 1 (to 2015)

The existing self-manoeuvring operation is functional and it limits the ground support needed as there is no push-back segment to the operations. It does however require relatively large areas of pavement compared with nose-in/push-back operations. With the addition of 5,500m^2 apron area and changing the operational mode from the self-manoeuvring to push-back, the apron can be rearranged to provide 5 Code C and 3 Code D stands. This would utilise the existing pavement, terminal and terminal frontage as much as possible and meet the stand demand for 2015, whilst minimising the capex outlay.

APM currently own tractors and tow-bars to facilitate this operational change. Remarking and re-configuration of the apron will be required to suit the terminal development.

Reconfiguring and the construction of additional apron should be initiated as soon as possible as the current stand demand already exceeds the existing capacity.

Stage 2 (2016 - 2025)

Where stage 1 developments will provide stand capacity over for the next 5 years; in 2016 additional stands will be required. There is potential to develop the stands as needed. However considering the relatively steep increase in stand demand between 2015 and 2025, with approximately three additional stands needed every 5 years, as well as, considering mobilisation costs, it is proposed that the second stage is completed in one phase.

On this basis the stage 2 development will require an additional seven stands in a westerly direction. This direction was identified as preferable as it avoids the river Cijevna and its surrounding environment as much as possible and it provides a solution that lends itself well to expansion should there be a need to increase the terminal face. It provides a layout where modification in order to meet airport specific stand needs is relatively straightforward.

The apron layout shown towards the end of this section shows four Code C stands positioned for contact with the terminal expansion and three remote Code D stands. A detailed study of the contact stand requirements, providing guidance on the optimum stand arrangement and the need for air-bridges and so forth should be undertaken at the time of planning the investment.

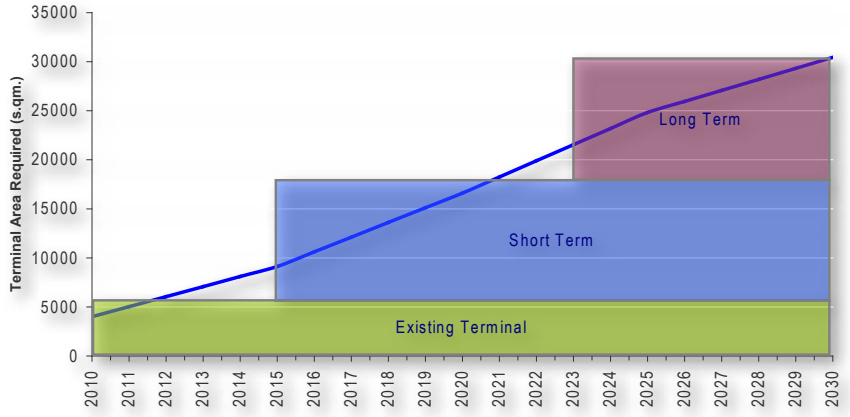
The layout also allows for additional (remote) stands to be constructed without disrupting operations too much. Should Code E aircraft commence regular operations, and there is a business case for it, a code E stand could be constructed just east off the remote Code D stands.

To meet the anticipated traffic the development should be completed around 2020, providing the 15 stands required in the long term.

Terminal

The terminal area required follows the graph shown in Figure 2.13 The line in the graph indicates the terminal area required and is based on the unconstrained traffic forecast and international best practice and benchmarking with other airports.

Figure 2.13 – Podgorica terminal expansion stages

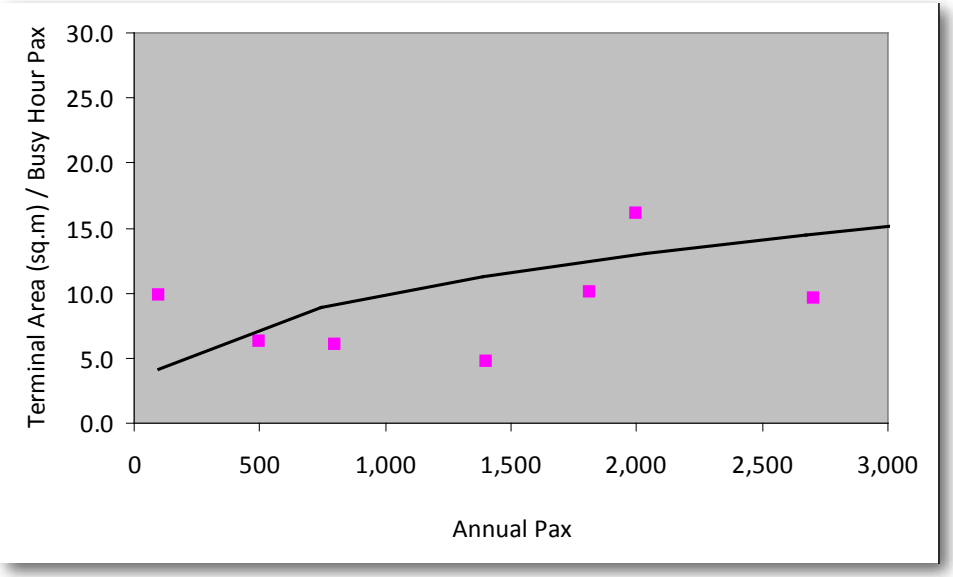


Source: Halcrow analysis

The existing terminal at Podgorica accommodates the current volume of traffic with relatively low area per Busy Hour Passenger (or BHPax), around 7m^2/BHPax. With higher throughput at international terminal, passengers and operators require a more sophisticated facility and additional area per passenger is required. There are many factors influencing this, for example the ground handling and baggage process areas expand as a result of increased BHpax. For example 2mppa throughput requires 2 ground handling operators to be in accordance with EU competition regulations.

With BHPax growth non-Aeronautical facilities are provided in greater scale and diversity to stimulate commercial revenues, and retail and food and beverage offerings will increasingly be attracted to the airport as the passenger numbers grow. Following the logic of other airports and international best practice the airport should be targeting acceptable passenger comfort, say IATA Level of Service C. Benchmarking Podgorica's forecast annual traffic figures with airports of that level of service, 15m2/BHPax is considered reasonable, as shown in the graph below. Airport examples considered as part of this benchmarking exercise include Varna Airport and Burgas Airport in Bulgaria, Macedonia's Ohrid Airport and Cape Town International Airport in South Africa. .

Figure 2.14 - Area/Busy Hour Passenger trend line at benchmark (comparable sized) airports



Source: Halcrow analysis

Tivat Airport

Tivat faces noticeably different challenges to Podgorica which it must try and overcome in the short term if it is to successfully meet forecast levels of unconstrained demand in the longer term. The development of a strategic Master Plan for Tivat must therefore consider the long term development requirements of the airport to accommodate forecast growth so that;

- Ultimate capacity and operational efficiency is not constrained by short term strategies which deal only with the immediate need
- Short and medium term investments are suitable for use over a sustained period, and the benefits of the investment are fully realised i.e. the asset can be used for most, if not all, of its serviceable life and preferably forms part of sequential long term development plan.

It is therefore important from the outset of the planning exercise to examine the long-term infrastructure needs, 20 years and beyond, before planning any interim, incremental steps towards this. There are several key requirements of the developed Tivat Airport which will have a major impact on its physical layout.

Firstly, in order to facilitate the spreading of the daily traffic peak and to maintain the attractiveness of the airport to operators it is necessary to facilitate extended hours of operation, particularly into the evening, and also to ensure operations can continue in conditions of reduced visibility. Whilst it is noted that instrument landing procedures are already implemented at Tivat Airport, as discussed in detail in the Interim Report produced by Halcrow and issued to APM, facilitating extended hours of operation will require the implementation of GNSS Instrument Operations technology to a standard in compliance with ICAO recommendations.

Secondly, the growth in peak hour ATMs throughout the forecast period will exceed the capacity of the existing airside system, necessitating the construction of a length of parallel taxiway to ensure demand is not constrained.

Although these requirements are largely independent of each other; the first being related to operating hours and conditions and the second to airside system capacity, the physical planning of the airport is driven to a large extent by their interrelationship.

Physical Safeguarding

Safeguarding of airport operations requires sufficient physical clearances between operating aircraft and other physical obstacles. These safeguarding requirements are achieved by the application of accepted international planning standards, defined by the Standards and Recommended Practices

(SARPS) of the International Civil Aviation Organisation (ICAO), as set out in Annex 14 to the Convention on International Civil Aviation (Annex 14).

Annex 14 establishes safeguarding requirements based on the Aerodrome Code, which is established based on the characteristics of the aircraft type operating, and whether or not there is navigation instrumentation present to give non-visual guidance to pilots.

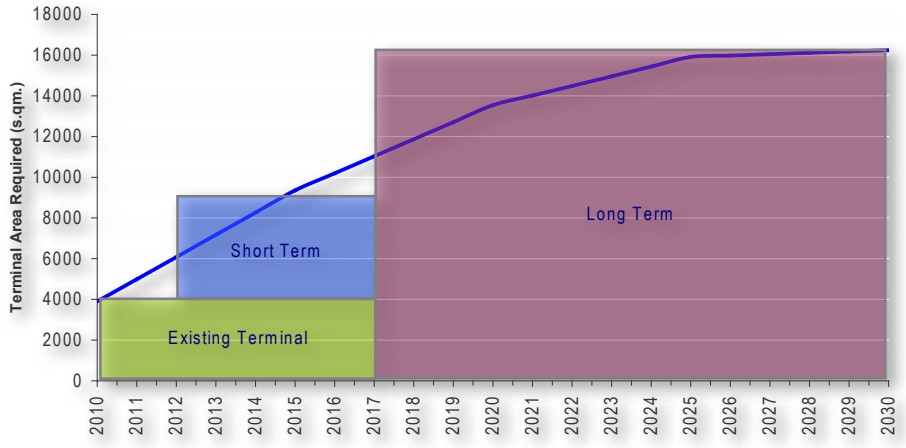
The current runway configuration is compliant with ICAO Code 4E physical characteristics in terms of length and width (although it is non-compliant with respect to the lack of shoulders). Code E aircraft do not currently operate and are not in the forecast fleet to the end of the master plan period. However, we consider that any development plan should be based on Code 4E criteria wherever practical so as to not unnecessarily constrain future operational flexibility and restrict the allowable operating fleet.

As discussed above, it is assumed that GNSS technology will soon be implemented at Tivat Airport and the operations will therefore be classified as Instrument Operations. On this basis all master planning is on the basis of ICAO SARPS for Instrument Operations.

ICAO SARPS require a minimum runway to taxiway centreline separation of 182.5m for a code 4, instrument airport. Furthermore, the requirements for obstacle restrictions establishes a clear and graded strip around the runway extending to 150m each side of the runway centreline which must be free of obstacles and an inclined plane (the transitional surface) which climbs from this strip edge with a slope of 1:7 which must not be penetrated by obstacles. It is this surface which defines the proximity of the aircraft parking positions to the runway, with the need to keep aircraft tails, and buildings and fixed infrastructure, below the plane of the transitional surface.

As discussed, the traffic at Tivat Airport exhibits a high seasonal peak which the terminal must be sized to accommodate. However, during the low season the terminal capacity will far exceed demand. Developing a terminal concept which would allow for areas to be closed during the winter period, without impacting core operations and passenger processing, would be beneficial as this would reduce staffing, heating and lighting requirements at these times.

Figure 2.15 Tivat Airport Terminal Area Required by Year (m2)



Source: Halcrow analysis

A typical concept layout which allows this type of operation is shown in Figure 2.16 and 2.17. This could be adopted at Tivat Airport to realise operational efficiencies and associated cost savings. Importantly, the layout does not preclude incremental expansion of the terminal building by addition of terminal and processing area in a linear configuration

Figure 2.16 Possible Terminal Configuration; Tivat Airport

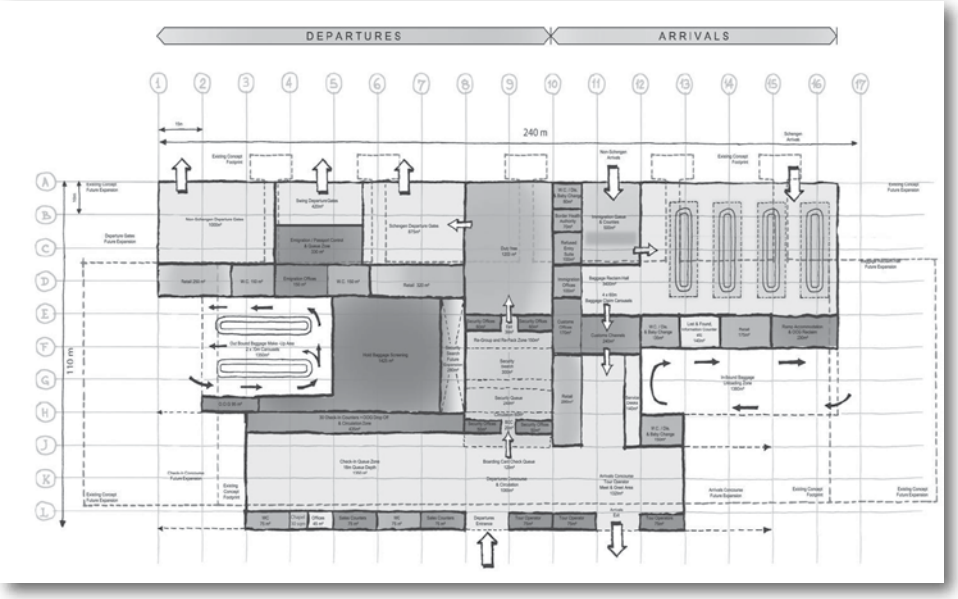
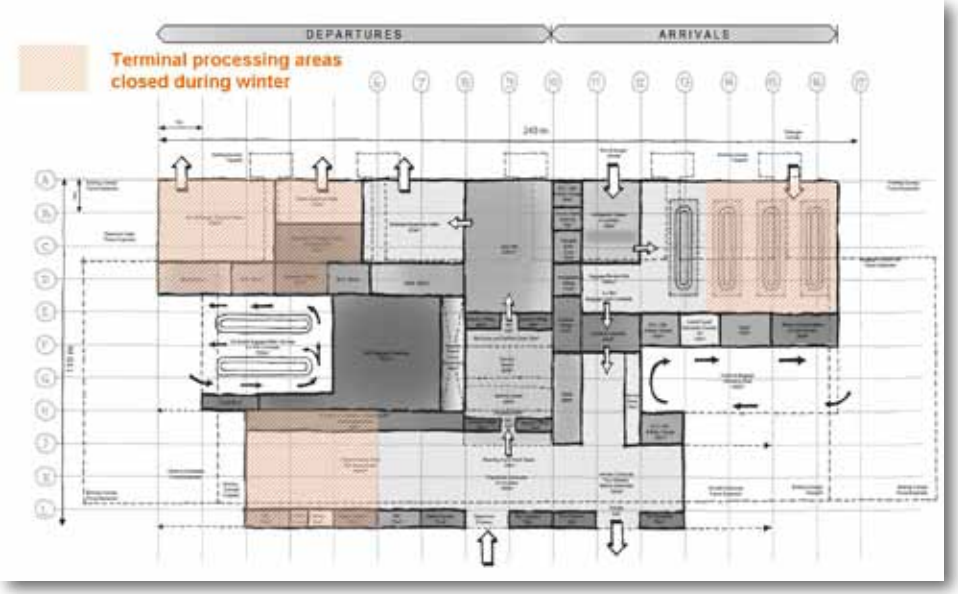


Figure 2.17 Operation of Terminal in winter months



Source: Halcrow

Landside access and car parking

Landside access and car parking

Access to the passenger facilities is by road, with a new access road required from the existing Ostrvo - Cvijeca road running along the southern boundary of the airport. Car parking for passengers and staff is all at surface level, in front of the main terminal building. A more detailed technical assessment of car parking provision should be undertaken during project development stage and in cognisance to APM's environmental objectives.

GSE maintenance

A new GSE storage and maintenance base is shown to the northern end of the passenger apron.

Water taxi / jetty

A jetty to enable water taxi operations between the airport and Tivat has been considered to be located just north of the current airport boundary. Passengers will then be able to transfer seamlessly from the terminal with shuttle bus service to the jetty and embark on a scenic and comfortable transfer to Tivat.

ATC

The existing ATC tower penetrates the obstacle limitation surface and should be removed from its current location. The ideal location for the ATC tower is to the west of the parallel taxiway, so as to not obstruct any future extension of this, to be beneath the OLS and sited to have unrestricted line of site of the whole airfield. Depending on the adopted phasing strategy and availability of land to the airport it may not be possible to site the ATC in this preferred location. This is discussed in more detail in subsequent sections.

Fire station

The existing fire station is ICAO non-compliant, in poor condition and in need of replacement. Reconstruction and extension of the facility in its existing location is not considered practicable. Given the proposed development layout, an optimum location for a new fire station facility is adjacent to the ATC, west of the parallel taxiway and close to the runway centre point. This provides good access to the apron areas and approximately equal (minimum) response times to both runway ends. It is acknowledged that there is an urgent need for provision of a compliant fire station and that this is required prior to realising surrounding infrastructure associated with location. APM have suggested an interim location east of the existing facility. Halcrow wish to note that this proposed new fire station location at Tivat is not an optimal location to meet the longer term aspirations contained in the AMP.

Runway strip provision

With the introduction of GNSS procedures the aerodrome will be classified

as an ICAO compliant instrument operation and should have full instrument strips in accordance with ICAO SARPS. A Code 4E instrument strip extend to a total width of 300m (150m each side of the runway centreline). Provision of this will require the diversion of the main Tivat-Budva Highway over a length of approximately 2,400m.

GA

General aviation is important to Tivat Airport and forms a considerable proportion of total traffic. Many aircraft require long term parking and we propose that GA activity is centred on the existing apron area in the north east corner of the airport. This will segregate GA from passenger operations, which are operationally desirable, and also allow existing assets to be utilised in the long term, with the existing terminal used as a GA facility. The GA apron will be self manoeuvre, with aircraft positioned to be outside of the instrument runway strip and below the transitional surface. This AMP recommends an extension of the runway strip to 150m either side of the runway centreline. The proximity of the existing GA stands to the runway makes them unsuitable for use once the runway strip is extended and ICAO compliant instrument operations are introduced as the aircraft on the stands would be obstacles to safeguarded surfaces.

A hangar/FBO base building is shown located adjacent to the GA terminal building. This is the same structure proposed for use a temporary passenger terminal in the short term, as described in the following sections of the report.

Stage 1 (to 2015)

Tivat is in need of urgent and significant development so as not to constrain forecast growth. Following on from the above-mentioned development, the most significant development required at Tivat in the short term includes:

- Provision of a seasonal/overspill Terminal structure, thereby increasing the existing terminal area by 150% by 2016
- Implementation of ICAO compliant GNSS procedures and provision of instrument safeguarding by 2015
- Construction of a partial parallel taxiway to address the immediate shortfall in airside system capacity
- Other short term development includes:
- Apron expansion in the north west for both GA and commercial operations
- A new GSE Base associated with the apron expansion
- Additional car parking area
- Upgrading of existing ATC & Fire facilities
- New jetty/facilities for Fire & Rescue services
- Runway Starter extension, if demand permits.
- Provision of runway shoulders
- Localised widening of taxiways

Stage 2 (2016 - 2025)

Development required in the long term includes:

- A new Terminal, with an ability to close parts to cover seasonal fluctuations in passenger demand, thereby increasing the terminal area 350% on the existing by 2020
- New apron, GSE base & facilities associated with the new terminal area in the south west
- New ATC tower & fire station located centrally with direct link
- to runway & on airside/landside boundary)
- Runway starter extension, if not pursued as a short term development, with potential to displace the threshold
- further south and increase declared runway length if demand dictates
- Land safeguarded for extended parallel taxiway if demand dictates
- Jetty expanded for water taxi facilities
- Old ATC & offices removed (penetrates Obstacle Limitation Surface;
- OLS). Existing Terminal also potentially penetrates OLS but
- resolved through structural alterations/lighting
- Road realigned to be outside the runway strip
- Apron & temporary Terminal used/refurbished for GA activities
- Development of the water taxi/jetty.

2.4.5 Military

The Montenegro defence compries an army, navy and air force.

The Montenegrin Air Force maintains a significant presence in the form of an Air Base at Podgorica Airport and shares the main runway with the commercial airport.

Following Montenegro's independence on June 3, 2006, the newly formed Military of Montenegro announced that it will not maintain a combat air force. At present, there are a range of military aircraft and helicopters at the Podgorica Air Base. The helicopters were incorporated in the newly formed air arm of the Military of Montenegro, while the fate of the jets and trainers is yet to be decided. The Podgorica Airbase is designated to become a regional helicopter pilots training facility.

The land occupied by the Podgorica Air Base has intentionally been excluded from this Master Plan study due to its strategic importance at regional and national level and because key decisions about the future role and activities have yet to be taken. However, we have implicitly acknowledged within our

AMP that the Montenegrin Air Force will maintain their sizeable presence at Podgorica over the life of the master plan.

2.4.6 Environmental and social impacts

Social Impacts

Up until the recent global economic crisis, travel and tourism in Montenegro was expanding rapidly whilst the Republic was regarded to be amongst the top three locations in the world for tourism expansion. Even in the current climate, Montenegro is still seen as having huge potential for developing almost all types of tourism and has a track record of successfully implementing such opportunities.

Aviation is critical to the country's economic recovery and long term policy objectives as it provides the crucial means to connect to the global business and tourism market. This in turns brings inward investment by creating jobs, reducing the cost of trade and opening up new business opportunities by attracting investment to previously untapped geographic locations and markets within the country. As well as allowing the movement of products and services quickly over long distances, aviation also enables economic and social participation by outlying communities' thereby further opening up Montenegro to the outside world. Aviation also acts as a catalyst for employment in other industries and sectors, notably driving the export of business, travel and tourism which are the lifeblood of Montenegro.

A recent study by Oxford Economics on behalf of the Air Transport Action Group (ATAG) found that

- aviation broadens people's leisure and cultural experiences via wide choice/affordable access to destinations across the globe;
- improves living standards and alleviates poverty through tourism;
- often serves as the only means of transportation to remote areas promoting social inclusion; and
- contributes to sustainable development by:
  - facilitating tourism and trade;
  - generating economic growth;
  - creating jobs; and
  - increasing tax revenues.

These benefits only serve to re-emphasise how critical aviation is to the social and economic well being of the country and therefore how important it is to continue to facilitate aviation growth within Montenegro in a well managed, planned and sustainable manner as presented in this AMP.

This is not to ignore some of the negative environmental consequences associated with aviation, such as noise or air quality.

Environmental Imapcts

The AMP represents the primary document for ensuring that the APM facilities, services and economic benefits are delivered in an environmentally responsible, sustainable and socially inclusive manner.

Climate change

From a global perspective, the greatest environmental challenge facing aviation today is climate change. The impact aviation emissions have on climate change continues to generate discussion and debate within the aviation industry.

Some see climate change as too esoteric and intangible whilst for others it is seen as a consequence of many sectors of the global economy, including aviation. Eurocontrol, a leading European aviation institution, has acknowledged that management of ATM operations could assist in reducing any adverse impact the aviation industry may have on climate change.

For any improvement to be truly effective, it may ultimately require a detailed political agreement and approach to be brokered both at international and national level.

On this important issue, the AMP recommends that APM continues to support its airports trade body, ACI Europe's commitment towards reducing carbon emissions with the ultimate goal of becoming carbon neutral on an agreed political basis.

In addition to supporting the ACI carbon commitment, APM should work towards developing its own carbon related initiatives such as its own emissions monitoring program, assessment of any future development of airport infrastructure for potential risks of climate change and consideration of the incorporating carbon cost into financial investment planning.

Sustainable Airport Development

Environmental issues associated with the operation and development of both airports and applicable to the master planning framework have been considered. The AMP advocates that APM introduces or continues to undertaken the following at Tivat and Podgorica:

- Using Energy Efficiently: Seek to reduce energy and greenhouse gas emissions by introducing cost-effective energy efficient initiatives and cleaner energy usage. This would include, for example, shutting down certain airport facilities during less busy periods (refer to Figure 2.17) and having motion sensor devices for public lighting within the Terminal. These proposals should help to align APM with climate change and energy efficiency ethos, as well as save operating costs and position both airports at the forefront of such endeavours.

- Protecting Water Quality: Implement policies to protect water quality and seek to incorporate innovative stormwater management and water recycling initiatives such as the capture and re-use of 'grey water' within existing and proposed new facilities recommended within this AMP. It is also suggested that APM consider a formal water quality monitoring programme at both airports which will help to instil enhanced water management procedures and future environmental compliance.
- Sustainable Transport: Explore on-going public transport initiatives with the state and other parties and encourage the use of other forms of sustainable transport. The AMP has sought to promote this approach at Podgorica (by safeguarding a future public transport corridor) and Tivat (by safeguarding an option of a new jetty and water taxi operation).
- Biodiversity and Conservation Management: Demonstrate an on-going commitment to biodiversity and conservation management. The AMP promotes this approach in relation to, for example, the juxtaposition between the river and future expansion at Podgorica Airport. Further work may be required to enhance adjacent areas of wetlands, native fish restocking, flora, fauna and re-vegetation works. Assessment of potential displaced bird migration patterns at both airports as a result of new airport infrastructure shall be required to address any environmental and safety concerns.
- Tourism & Heritage: Consider the heritage value of existing sites and areas which may be particularly relevant at Tivat. This may require more active heritage management and preservation given the importance of tourism to the Montenegro economy.
- Recycling & Waste Management: Continue to focus on implementing recycling opportunities; waste minimisation initiatives and waste and resource management policies;
- Managing Soil & Groundwater Contamination: Continue to minimise the potential for soil contamination and actively managing acid sulphate soils through the implementation of best-practice environmental controls; preventative measures; procedural guidelines for managing spills and the release of hazardous materials into the water table and adjoining water course. Within the AMP we have recommended that as and when the new fuel farm is built at Podgorica it confirms with current requirements and best practise and that the existing site is suitably decontaminated.
- Partnerships with Key Stakeholders: Seek to develop partnerships with local groups and Government agencies to ensure airport development and operational objectives are incorporated into relevant policy frameworks, such as the Spatial Planning system, so APM's longer term aspirations are realised. Podgorica and Tivat Airport are considered strategic assets at a local, regional and national level. APM has a social obligation to consult with and inform stakeholders its long term development plans. As part of this, development of locally sensitive design, to protect amenity values of the surrounding areas, should also be pursued.

Although the above philosophy addresses a number of important environmental initiatives, in practical terms, the two most significant ground-based environmental issues faced by those living close to Podgorica and Tivat airports remains noise and air quality.

The following sections, presents some of the relevant issues and the AMP response on these matters.

Aircraft Noise Management

It is generally acknowledged that whilst commercial aircraft have become more efficient and noticeably quieter over the last twenty years this reduction in noise has been off-set by the significant growth in aircraft movements during the same period.

Within Europe, noise-based aircraft operating restrictions have been in force at airports since 1992 with the banning of the noisier (Chapter 2) aircraft under Directive 92/14/EEC. Ten years later, Directive 2002/30/EC sought to establish rules and procedures with regard to the introduction of noise related operating restrictions at Community airports.

The EU follows ICAO's "balanced approach" for airport noise management and the AMP advocates that this same approach is adopted at Podgorica and Tivat. This approach consists of identifying the noise problem at an airport and then analysing the various measures available to reduce noise through the exploration of four principal elements: reduction at source (quieter aircraft); land-use planning and management (through the spatial planning process), noise abatement operational procedures and operating restrictions (to be coordinated with Eurocontrol, through SMATSA), with the goal of addressing the noise problem in the most cost-effective manner.

Montenegro airlines have sought to introduce new, quieter and more economically efficient aircraft whilst the low cost carrier market are also characterised by using similarly efficient aircraft. This should result in air and ground borne noise being reduced in the short term and maintained at around current levels over the duration of the AMP. The spatial planning process in Montenegro, supplemented by this AMP, potentially has the more significant role to play in ensuring that land around both airports and along the flight paths are not inadvertently designated for incompatible land use activities such as residential development, schools or places of worship.

In the medium to long term, the activities being undertaken by Eurocontrol and administered by SMATSA may start to yield both localised and wider

climate change improvements although this requires more detailed work and greater coordination as stated.

In summary, optimised forward land use planning coupled with improved aviation engineering efficiency and enhanced operational procedures should sufficiently off-set the airport growth expectations envisaged over the life of the AMP.

Protecting Air Quality

The EU has recently sought to consolidate a number of legislative documents concerning air quality in the form of Directive 2008/50/EC. Together with National Emission Ceiling (NEC) directive, these represent the two most significant pieces of European legislation governing aviation emissions.

A report from the European Environment Agency indicates that road transport remains Europe's single largest air polluter. Even around big airports, the road system is the biggest source of air pollution. Nevertheless, emissions from aircraft, air-side support vehicles and airport related traffic all contribute to a build up of potentially harmful greenhouse gases such as nitrogen dioxide (NO2); carbon monoxide; VOCs (volatile organic compounds); ozone and small particulates such as PM10 and PM2.5.

The majority of aircraft emissions during flight do not directly expose humans to pollutants as the planes move up into the higher atmosphere. However ground based air pollution does occur as aircraft start up engines, taxi to and from the runway and on the runway itself. This can result in high concentrations of harmful gases and particulates around airports.

The AMP has sought to maximise runway capacity gains and airfield infrastructure provision whilst minimising aircraft taxiing, runway occupancy and engine ground running activities, and therefore emissions, through the use of modelling tools. The proposed AMP therefore strikes an appropriate balance between facilitating growth and minimising air quality impact at a localised level.

We would also strongly recommend that APM review options for the use of alternative fuels for operational and airport management vehicles. In addition, APM should explore the use of fixed electrical ground power units to minimise the use of noisier on-aircraft auxiliary power units. If a suitable business case can be prepared, such an approach would not only improve air quality and but would also help reduce greenhouse gas emissions.

In developing our proposal for the Airports of Montenegro Master Plan, we have given considerable thought to the environmental implications of our proposals. Generally speaking, we have sought to maintain current operational procedures; avoid the need for additional 'green field' sites and avoid populated and environmentally sensitive areas. For example, at Podgorica we have avoided expanding the airport in the direction of the river as had previously been proposed. Not only do we believe that this affords an optimal economic and operational solution for the airport as discussed in section 2.5 but it means that the current ecological habitat surrounding the river remains broadly unaffected by future airport expansion. This maintains the current planning, environmental and design approach adopted by APM in seeking to blend the existing airport into the surrounding terrain and environment as far as possible. It is also strongly recommended that the future relocation of the fuel facility is not only compliant with appropriate regulations and requirements but that it also bears the cost of decontaminating the existing fuel farm site.

We have continued this approach, of seeking to minimise the environmental impact of future airport expansion, at Tivat. For example, we have been extremely diligent in challenging the timing of future expansion and sought to steer future development away from the existing nature reserve and other sensitive areas. Our objective or ensuring compatibility with the Spatial Plan for the region has allowed us to ensure that we strike an appropriate balance between the needs of the airport; the built and natural environment and the need and timing of supporting off airport infrastructure (e.g. road network).

Tivat Airport aircraft parking

2.5 Review of Podgorica and Tivat Airports

2.5.1 Identification of options

Proposed Master Plan for Podgorica Airport

Short Term Developments

The short term development requirements planned at Podgorica Airport, to be complete within the next five years, are shown on the Short Term Development Drawing at Appendix 2.

The following is a brief, supplementary description of the development elements shown.

Terminal Expansion

The passenger growth at Podgorica is forecast to reach the terminal capacity in around 2012 after which the terminal area will provide a reduced, inadequate level of service for passengers. Whilst this is not a limiting factor for traffic growth in the short term, expanding the terminal should not be delayed as this would create a poor quality experience for the passengers. In the medium term, as traffic continues to grow, the lack of capacity would result in operational complications and, in addition to ever decreasing standards of service, would start to limit capacity and constrain growth.

It is reasonable to allow a reduction in peak hour service levels for a period prior to development and, as shown in Figure 2.13, to defer investment costs as far as practical and balance the over provision of capacity following a development stage. This approach to development phasing compared to demand is shown in Figure 2.13, with the proposed opening of the first stage of terminal expansion of 12,500m^2 in 2015.

This development is to the north of the existing facility, with a linear extension of the frontage to the apron.

Apron Expansion

To accommodate the immediate forecast growth in passenger aircraft stand demand to 8 aircraft, 5 Code C and 3 Code D by 2015 an extension of the apron to the north. To maximise the usability of the area provided and minimise new area required parking is all planned to be nose-in, push-back. In addition to the clear area required for aircraft parking and servicing, hard-standing areas are provided for GSE staging close to the stands for operational efficiency.

Car Parking

Additional Car parking is the west of the existing, filling the area available up to the existing circulatory/access roads. A minor diversion of the local access lane to the north-east of the site is required around the proposed terminal expansion.

Refurbishment of Fuel Depot

Maintenance and refurbishment to replace or upgrade ageing infrastructure at the existing fuel depot is allowed for to ensure continued operational safety, security of supply and environmental and regulatory compliance.

GA Apron

The GA apron is shown extended linearly to the south to provide an additional two self-manoeuvre parking positions.

GSE Facilities

Existing GSE parking and maintenance facilities do not meet operational requirements. To address this, a new GSE hard-standing is shown to the south of the ATC tower, adjacent to the expanded GA apron. In addition to the parking hard-standing a hangar/workshop is shown for indoor storage and engineering maintenance of equipment.

FCR Vehicle Access

A new link road from the Fire Station to the runway is shown as a continuation of the existing access road to the parallel taxiway. This will improve runway access and shorten emergency response times.

GSE Base

As discussed above, the current provision of GSE facilities is inadequate. In addition to the hangar/workshop adjacent to the fire station, a main GSE base with internal parking and major overhaul capability is proposed. This is shown at the southern end of the passenger apron as a potential location, sited with good proximity and access to the main GSE operational area.

Fuel/Oil Interceptor Relocation

It is not fully understood at this stage if it is necessary to relocate the storm drainage fuel/oil interceptor but the potential has been indentified. If it is required the proposed location is shown between the main passenger apron and the parallel taxiway.

Runway Shoulders

Runway shoulders are required to achieve compliance with ICAO Annex standards for Code 4E operations. Similarly some local taxiway widening, including the parallel taxiway, is required to allow compliant wheel clearance to taxiway edges where aircraft are turning. A detailed pavement assessment is required, separate to this master planning study, to identify pavement areas to be refurbished or reconstructed.

Podgorica Airport Master Plan 2030

The proposed master plan development to accommodate forecast growth to at least 2030 is shown at Appendix 3. The key development elements, as shown on the plan, are briefly described below.

Terminal Expansion

A second tranche of terminal development of 12,500m^2 is proposed to the west of the short term development. As shown in Figure 2.13, the proposed development is to be completed in 2023 to provide a reasonable balance demand and capacity and the phasing of development investment costs.

It is considered that a 90° rotation of the terminal and apron will provide for a greater long-term capacity potential. A continued linear development would be restricted by the river to the north and would not, in our opinion, allow for a second remote line of stands on the runway side of the apron as the aircraft would restrict aircraft taxiing routes to/from the runway end and apron and/or penetrate obstacle limitation surfaces.

Apron Expansion

Development of additional aircraft stands to the north west of the airport is required to accommodate forecast parking demand. Code C aircraft are shown adjacent to the terminal, with Code D remote, to maximise the number of contact stands. Sufficient clear area on the hard-standing is shown to allow for safe and efficient GSE access and room for staging adjacent to stands.

Car Parking

Additional car parking is shown to accommodate growth in passenger numbers and demand to the west of the existing. Further diversion of local roads is required around the expanded terminal and apron to maintain access to the north east.

Fuel Depot

A new fuel depot is shown to the north west of the site, adjacent to the expanded passenger apron, replacing the existing, time expired, facility. This location has been carefully considered so as not to prevent future developments. A hydrant refuelling system could be considered at the time of installation. Justification should be based on a robust analysis of operating and business case analyses.

GA Apron

Expansion of the GA apron is required with an additional stand provided to the south of the ramp.

Police Base

A new police base is provided at the north of the remote apron. A new apron area will be provided at the building front for the parking of fixed and/or rotary wing police aircraft.

Cargo

An expansion of the existing cargo warehouse facility is shown to accommodate forecast growth in general cargo associated with increasing commercial operations. It is not anticipated that a major cargo hub base will be required at the airport.

Airport Related Commercial Development

Land should be safeguarded for the provision of airport related commercial development. The type of commercial facilities adjacent to an airport varies and can include freight handling, logistics, general office, high-tech industry, etc. A plot has been shown to the west of the car parking area, in close proximity to the airport and with good access to the airport and the local transport network.

Public Transport Corridor

A corridor for improved public access by provision of a rail spur from the mainline to the west to the terminal area is safeguarded in the master plan. This could facilitate improved inter-modal transfer in the long term and reduce reliance on private transport for airport access.

Fire Training Ground

A fire training ground with aircraft fire simulator, accompanying gas tanks, drainage and control rooms are shown in the south west of the site.

Proposed Master Plan for Tivat Airport

The proposed master plan at 2030 is shown at Appendix 3. As discussed earlier, it is not feasible to continue long-term development of the airport with passenger facilities retained in their current location and the long-term strategy is to relocate the passenger terminal and aprons en-masse to the south west of the airport as soon as possible. Given restrictions in land availability and the time required to acquire this it is expected that operations will continue in and around the current terminal location until at least 2017. Nevertheless, to maintain operational capacity up to this time, there will be a need to invest in short-term developments. These are shown at Appendix 2 and are briefly described below.

Short Term Developments

Partial Parallel Taxiway

A half length parallel taxiway is provided, which will increase runway capacity to at least 17 ATM/hr, more than capable of handling the long-term forecast peak of 15. Runway to taxiway separation is compliant with ICAO SARPS for Code 4E, instrument operations, based on the assumption that GNSS procedures will ultimately be adopted. The taxiway is located to the southern end of the runway to serve the future terminal location.

Runway Starter Extension

To provide compliant RESA at the Runway 14 threshold it is likely that the end of Runway 32 will need to be displaced to the south. This may require the

provision of a starter extension to maintain runway take off length and land is shown safeguarded for this purpose. The requirement should be confirmed based on aircraft loads, performance, sector lengths, etc. as required..

Displaced Threshold 14

To maintain obstacle clearance to the perimeter fence and vehicles on the local road, Runway 14 threshold should be displaced to the south.

Passenger Apron Expansion

To maintain capacity through to 2017 the passenger apron is expanded to the north to provide an additional Code D, self manoeuvre stand. The position is pushed as far east as possible to minimise/remove any infringement of the transitional and other obstacle limitation surfaces, so as to not worsen existing regulatory non-compliances.

Seasonal/Overspill Passenger Terminal

Additional passenger terminal area is urgently required to process peak hour demand. Assuming that a new permanent facility would be open in 2017 it is recommended that facilities be provided to accommodate peak demand up to 2017, with an additional area of 5,000m^2 to give a total of approximately 9,000m^2 (see Figure 2.15). Beyond this, in the final 2 years of its operation, passenger levels of service would fall below target during peak traffic periods but would remain acceptable for the majority of time. This is a normal strategy in terminal planning.

Considering the high seasonal and weekly peaks in the schedule it is likely that the additional capacity would only be required on the peak day, Saturday, for up to 4 months of the year. Furthermore, any new facility constructed would only be used for 5 years, prior to opening of the new terminal in the location shown in the master plan. On this basis, it is recommended that the expansion of the terminal facilities is achieved using a temporary facility, which is only opened at peak times. This minimises initial construction costs and operational and staffing costs, with the facility closed except for on peak summer days. This is a model that is used at other European airports with similarly peaky traffic patterns, such as Geneva.

The terminal expansion could either be entirely self-contained and separate from the main passenger terminal, or else there could be a passenger link to allow passenger flows between the two. The building structure should be low cost and could either be a temporary structure such as a steel frame, fabric clad building, or a warehouse/hangar type building with internal ground fixed partitioning to achieve operational needs. The first example is currently used at Leeds Bradford Airport in the UK and the second is the model adopted at Geneva and Varna airports. The plans developed show the latter with the partitions and equipment removed (for use in the new terminal) and the building being converted to either a maintenance hangar for small (Code B & C) aircraft, or an FBO base.

GSE Base

A new GSE base is provided to the north of apron with hard-standing for equipment parking and a building for sheltered storage and/or maintenance. Additional space is available for an aircraft catering facility if required.

Upgrade of ATC and Fire Station

The existing facilities are to be upgraded as an interim measure prior to the provision of new facilities to the west of the runway in 2017. The existing tower significantly penetrates the OLS and the acceptability of retaining and upgrading in its current location should be confirmed with the regulator.

Podgorica Airport arrivals concourse

Jetty

A jetty is to be provided to facilitate sea access for fire and rescue services. This is shown in the north west corner of the airport, adjacent to the highway for land access.

Runway Shoulders

Runway shoulders shall be provided to achieve compliance with ICAO SARPS for Code 4D operations

Taxiway Widening

Taxiways shall be locally widened to achieve ICAO compliance for Code 4D aircraft and to ensure fillets at turns are sufficiently wide to meet wheel-to-edge clearance requirements.

GA Apron

The GA apron is expanded to the south to provide a total of 8 self-manoeuvre GA stands to accommodate forecast growth to 2017.

Tivat Airport Master Plan 2030

The proposed master plan is shown at Appendix 3. The key elements are briefly described below.

Passenger Apron

The passenger apron is shown in the south west corner of the airport. It is sized to accommodate the forecast stand requirements at 2030 of 4 Code D and 5 Code C aircraft, with a total paved area of 47,500m2. Whilst not in the forecast fleet, the layout allows for, with the provision of a small additional paved area if and when required, parking of Code E aircraft.

Aircraft stands shall be nose-in, push back parking to minimise apron construction. This will require the use of tractors/tugs by APM or an appointed ground handling agent.

Terminal Building

As previously discussed, the planning of terminal buildings should take account of the increasing complexity of the building by providing an increasing area per busy hour passenger as traffic grows. Based on the trend presented earlier and applying this to forecast traffic figures the required terminal area by year is shown in Figure 2.15 and the terminal area provided at the master plan horizon of 2030 is 16,000m2.

Given the seasonal and weekly peaks in the schedule consideration should be given at the planning stages to providing a terminal building which can be partly closed when not required to reduce running costs and maintain efficiency.

GSE Base

With the relocation of the majority of operations to the south west of the airport the focus of GSE provision will also be in this area. Accordingly a GSE base and staging areas should be provided adjacent to the passenger aprons for ease of access and operational efficiency.

ATC & Fire Station

A new fire station and ATC facility shall be provided to the west of the parallel taxiway, at approximately the mid-point of the runway. This will provide good line of sight across the entire airfield and, with a link directly to the runway, approximately equal and minimal response times to both runway ends. Staff access to the facilities will be possible landside and airside using the adjacent landside road or airside perimeter road respectively.

Starter Extension

A starter extension to Runway 32 is shown to ensure adequate TODA & ASDA can be maintained with the displaced Runway 32 end necessary to ensure adequate RESA at the northern runway end (14).

Parallel Taxiway Safeguarding

Whilst it is not forecast that traffic will reach peak levels requiring the provision of an extension to the parallel taxiway beyond the half-length shown in the short term, it is considered prudent to safeguard land for a future extension to allow direct access to the southern GA apron link, as shown.

Water Taxi Facilities

The jetty constructed in the short term for emergency services use shall be expanded to provide for public access by water taxi/private boat. This will improve inter-modal transfer to the airport (for onward road transfer to the terminal).

Removal of Obstacles

The existing ATC tower and offices are obstacles, penetrating the airport safeguarded surfaces. With the provision of new ATC facilities to the west of the runway these can be demolished to improve the regulatory compliance of the airport.

The existing terminal building, which is proposed to be used as a GA terminal, marginally penetrates the transitional surface and the required course of action to address this needs to be examined with the regulator and could include either partial demolition and/or lowering of the terminal front, or lighting of the building with obstacle lights.

Highway Realignment

Future traffic growth relies, in part, on the introduction of instrument operation. This, in turn, requires the provision of instrument standard facilities and clearances, including the provision of ICAO instrument compliant runway strips. The existing Tivat-Budva highway is within 150m of the runway centreline and therefore within the envelope of a Code 4D, instrument runway strip. It is therefore proposed to realign the highway to be outside of the runway strip, as shown.

GA Activities

With the transfer of passenger operations to the new facilities the existing passenger terminal, passenger apron and seasonal/overspill terminal are available for dedicated GA operational use. Adjacent facilities could also

be modified or land made available for cargo facilities if demand dictates.

GA aircraft should be parked at the north eastern end of the apron to be outside the proposed instrument runway strip and clear of obstacle protection surfaces. The existing terminal building can be used as a dedicated GA facility with segregated provision for VIP/CIP operations if considered necessary. The seasonal/overspill terminal structure can be cleared internally and, with amendments to cladding as required, doors added to allow aircraft access and the facility used as hangarage/maintenance/FBO operations as desired.

2.5.2 Option Evaluation

Ordinarily one would undertake a high level option evaluation study where there were many plausible master plan options to consider and choose from; a complex series of objectives pertaining to those options and variety of key stakeholders to engage with. This was not the case at Podgorica, due to the limited range of realistic options available for the airport. Consequently, the master plan strategy was relatively straight forward and coherent. More importantly, whilst the philosophy and approach was challenged in some areas (as noted earlier), the development approach and strategy was generally accepted and supported by both APM and EIB.

At Tivat, the situation is very different. Whilst the overall Airports Master Plan for 2030 was understood and supported by all, there were a number of competing philosophical approaches to meeting the short term development requirements. These amounted to a fully compliant; non-compliant and hybrid option consisting of elements the former two options. For completeness, this was then assessed against a, 'do nothing' option.

The following table summarises the evaluation exercise conducted for the short term development options considered for Tivat Airport based on APM and EIB interpolation. The process involved creating a primary objective (raison d'être) as set out in the AMP together with a series of weighted and therefore ranked sub-objectives. Any sub-objectives which were obligatory to all options or 'statutory' requirements were excluded. Options 3 and 4 incorporate a degree of subjectivity and interpretation of 'compliance' prevalent during discussions with APM. Scoring was on a scale of 1 to 5 where 5 was 'good' and 1 'bad'. The best scoring options in terms of 'Total Scores/ Ranking' was considered the most favourable option to pursue

Initial discussions took place with APM on the development of an agreed set of assessment criteria for master plan options at Tivat. Halcrow has sought to incorporate APM's thoughts. Nevertheless, the evaluation process in the AMP represents Halcrow's scoring assessment for the short term development options at Tivat.

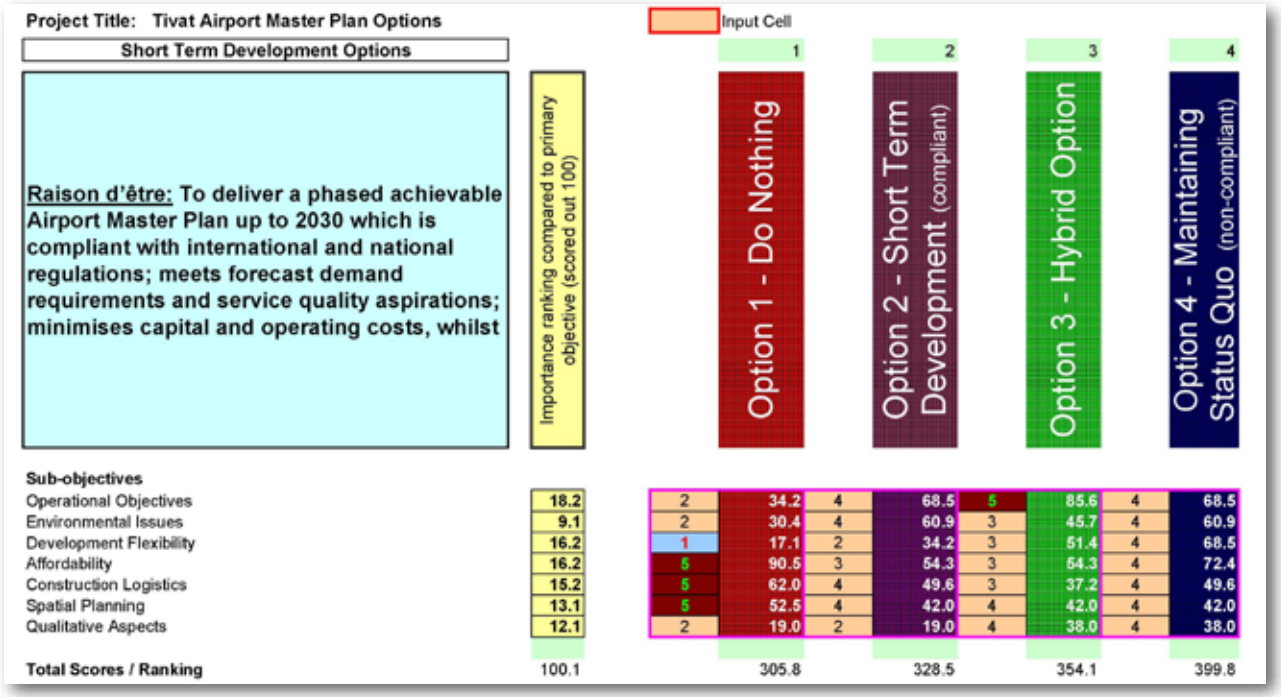
Preferred short term development option at Tivat

From both an APM and EIB assumed perspective, Option 4 is considered most favourable but cannot be justified given that it maintains the current non-compliant airport status in certain key areas and therefore contravenes the terms of this AMP study. The lowest score is for 'do nothing' which is not a realistic option for APM. Option 2 is the next least desirable but again, is understandable given the relatively low affordability score. The hybrid option (Option 3) understandably, falls within the scores for Options 2 and 4 and is the option recommended in this AMP.

2.5.3 Development and phasing plans

Appendix 2 and 3 illustrate our proposed layout for short and long term (Master Plan) at both Podgorica and Tivat Airport based on Option 3 in Fig 2.18.

Figure 2.18 Option evaluation: Short term development option at Tivat



Project Title: Tivat Airport Master Plan Options

Input Cell

Short Term Development Options

Raison d'être: To deliver a phased achievable Airport Master Plan up to 2030 which is compliant with international and national regulations; meets forecast demand requirements and service quality aspirations; minimises capital and operating costs, whilst

Sub-objectives	Importance ranking compared to primary objective (scored out 100)	Option 1 - Do Nothing		Option 2 - Short Term Development (compliant)		Option 3 - Hybrid Option		Option 4 - Maintaining Status Quo (non-compliant)	
		1		2		3		4	
Operational Objectives	18.2	2	34.2	4	68.5	5	85.6	4	68.5
Environmental Issues	9.1	2	30.4	4	60.9	3	45.7	4	60.9
Development Flexibility	16.2	1	17.1	2	34.2	3	51.4	4	68.5
Affordability	16.2	5	90.5	3	54.3	3	54.3	4	72.4
Construction Logistics	15.2	5	62.0	4	49.6	3	37.2	4	49.6
Spatial Planning	13.1	5	52.5	4	42.0	4	42.0	4	42.0
Qualitative Aspects	12.1	2	19.0	2	19.0	4	38.0	4	38.0
Total Scores / Ranking	100.1		305.8		328.5		354.1		399.8

Note: for a larger version of this diagram, please refer to Appendix 5

Source: Halcrow

3 Airports of Montenegro Short Term (2015) and Long Term (2016 to 2030) Investment Plans

3.1 Detailed Investment Plans

The following two tables (2.21 and 2.22) present the detailed short term and long term (Master Plan) capital cost estimates for Podgorica and Tivat Airports associated with the development options presented and referred to in section 2.5 of this document.

We believe that this investment represents an optimal solution between what APM aspire to achieve and what is realistic given the need for certain approvals to be gained and a robust business case to be in place.

These Plans presupposes that process improvements and infrastructure efficiencies are put in place and exhausted by APM before undertaking such investments.

The Plans represent business plan and budgetary investment targets at current prices commensurate with a Master Plan. Allowances have been made for contingency, risk, on-costs and consultancy fees at an aggregate level for each stage. It would be inappropriate at this stage in the project life cycle to try and take into account further investment risks and opportunities which may materialise during the respective project business case stage; project formulation; procurement; project management and operational readiness stage, etc. Furthermore, decisions on whether to proceed with certain investments will depend on a number of factors, some of which are discussed in section 4. The investment plans do not allow for land acquisition costs and associated legal fees, permissions, approvals, etc.

Figure 3.1 CAPEX Investment Plan – short and long term development (opposite)

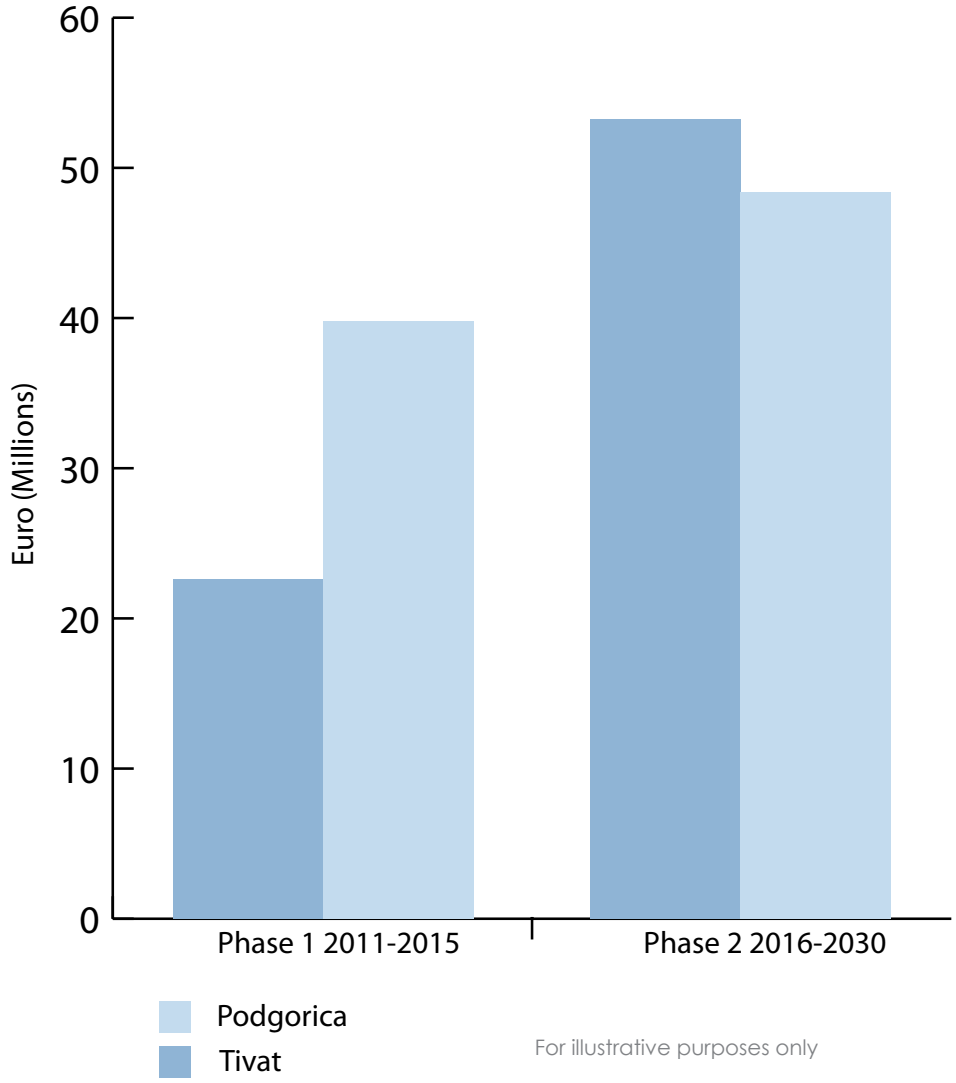


Table 2.21 Podgorica Investment Plan

Item	Unit Rate	Quantity	Cost
Short Term Developments			
Terminal (m^2)			
- New	€1,500	12,500	€18,750,000
- Intergrate/Amend Exisiting	€500	5,500	€2,750,000
Apron (m^2)	€120	11,500	€1,380,000
Taxiway Widening (Shoulders) (m^2)	€45	58,000	€2,610,000
Runway Shoulders (m^2)	€45	36,000	€1,620,000
Earthworks & Drainage	10% paving costs		€561,000
Fire & Rescue Access Road (m^2)	€30	1,000	€30,000
Relocate Fuel Interceptors (incl. tanks)	Nominal Sum		€150,000
GSE Parking & Facilities (incl. shelter)	Nominal Sum		€300,000
Car Park & Forecourt (m^2)	€45	9,000	€405,000
Fuel Farm Upgrade	Nominal Sum		€1,000,000
Supporting Facilities (e.g. offices, substations)	Nominal Sum		€600,000
Sub-total			€30,156,000
Contingency	25%		€7,539,000
Consultancy Fees	7.5%		€2,261,700
Total Short Term Developments			**€39,956,700**

Item	Unit Rate	Quantity	Cost
Long Term Developments			
Terminal (m^2)	€1,500	12,500	€18,750,000
Apron (m^2)	€120	27,500	€3,300,000
Taxiway (m^2)	€90	26,000	€2,340,000
Shoulders (m^2)	€45	9,000	€405,000
Earthworks & Drainage	10% paving costs		€604,500
Car Park & Forecourt (m^2)	€45	18,000	€810,000
Fire & Rescue Training Facilities	Nominal Sum		€100,000
Relocation of Fuel Farm	Nominal Sum		€4,000,000
Expansion of Air Cargo Facilities (m^2)	€800	1,500	€1,200,000
Maintenance Facilities Development (m^2)	€800	4,000	€3,200,000
Police Station (m^2)	€1,200	1,000	€1,200,000
Local Roads (m^2)	€45	2,500	€112,500
Air Field Security Fence (m)	€90	1,100	€99,000
Sub-total			€36,121,000
Contingency	25%		€9,030,250
Consultancy Fees	7.5%		€2,709,075
Total Long Term Developments			€47,860,325
Total			€87,817,025

Table 2.22 Tivat Investment Plan

Item	Unit Rate	Quantity	Cost
Short Term Developments			
Temporary Terminal (m^2)	€850	5,000	€4,250,000
Apron (m^2)	€120	16,000	€1,920,000
Taxiway (m^2) (incl. GA apron)	€90	44,500	€4,005,000
Shoulders (m^2)	€45	77,700	€3,496,0005
Earthworks & Drainage	10% paving costs		€942,150
AGL & Power Upgrade for Instrument Ops		1	€500,000
Integration of ATC, Fire Station & Baggage Services	Nominal Sum		€1,000,000
GSE Facilities		1	€150,000
Sea Rescue Facilities		1	€100,000
Car Park and Forecourt (m^2)	€45	10,000	€450,000
Airfield Security Fence	€90	3,000	€270,000
Sub-total			€17,083,650
Contingency	25%		€4,270,913
Consultancy Fees	7.5%		€1,281,271
Total Short Term Developments			**€22,635,836**

Item	Unit Rate	Quantity	Cost
Long Term Developments			
Terminal (m^2)	€1,500	16,000	€24,000,000
Apron (m^2)	€120	73,000	€8,7600,000
Runway Starter Extension (m^2)	€90	22,000	€1,980,000
Earthworks & Drainage	10% paving costs		€1,074,000
GSE Facilites		1	€300,000
Local Roads (m^2)	€45	35,000	€1,575,000
Supporting Facilites (e.g. offcies, substations)	Nominal Sum		€500,000
Fire Stetaions	Nominal Sum		€1,000,000
Car Park & Forecourt (m^2)	€45	18,000	€810,000
Airfieild Security Fence (m)	€90	3,500	€315,000
Sub-total			€40,314,000
Contingency	25%		€10,078,500
Consultancy Fees	7.5%		€2,023,550
Total Long Term Developments			€53,416,050
		Total	€76,051,886

Source: Halcrow

3.2 Investment alternatives and sensitivities

The Airport of Montenegro detailed Investment Plans set out in section 3.1 are based on the proposed Development Options set out in section 2.5 of this document.

As already discussed, in preparing this Airport Master Plan we considered a range of alternative development options and iterations and therefore investment scenarios and sensitivities, in arriving at what we and our key stakeholders felt were the optimal development options.

It is generally accepted that the trade off involved in delaying investment in peak period terminal capacity is potential degradation in quality and passenger experience. This is countered by the fact that air traffic in Montenegro and at Tivat in particular is very biased towards the summer months and therefore for long periods of the year, the terminal buildings are generally under utilised. Terminal expansion should therefore ideally be designed to cost effectively accommodate peak season demand as far as practicable.

Whilst apron capacity is less forgiving than terminal capacity, there are nevertheless options to build in better investment timing flexibility through a more progressive capacity provision. This is due to relatively shorter construction lead in times for apron capacity compared to a terminal building.

We have also considered both accelerated and delayed economic growth and therefore passenger forecasts. Our Airports Master Plan has been optimised to cater for either eventuality. Nevertheless, current informed specialist opinion suggests that the Montenegro economy will return to recovery mode during 2011 and continue thus over the next five years at least, at the rate included within our air traffic projections.

Our investment philosophy has focused on a number of optimised objectives including:

- Maximising the economic life of existing assets;
- Minimising writing off assets before expiration of their financial or economic life;
- Adopting a creative and pragmatic approach to infrastructure provision and the absolute latest timing for such provision and consequential investment decisions;
- Enhanced cash flow management through development timing flexibility;
- Integration with existing and proposed spatial planning policy; and
- Adherence to environmental best practise and minimised environmental impact.

At Podgorica, the original airport layout (airfield, terminal and landside areas) has already been set out with sufficient foresight to accommodate future growth and development. The major investment issues concerned the setting out of further terminal and apron provision and the connecting runway taxiway system. In summary, this involved extending key infrastructure on either a linear or rectilinear basis. In overall investment terms, the difference was negligible. However, for reasons of planning and operational flexibility as stated earlier, the rectilinear terminal expansion option with accompanying landside and airfield infrastructure affords the greater flexibility and minimises environmental impact due to having to culvert, build over or divert the adjacent river (see Appendix 2 and 3). This option therefore not only allows relatively easier expansion beyond 2030 if required but in the short term, allows better cash-flow management by enabling for example, the development of remote stand capacity to meet demand as demand dictates. There are other operational and CAPEX minmisation benefits. Furthermore, one cannot physically provide compliant remote stand capacity with the linear arrangement option due to infringement of runway and taxiway obstacle clearances.

At Tivat, some of the options considered included full compliance; non-compliance and hybrid schemes which sought to challenge both ours and APM's preconceptions; conventional logic and best practice. In particular the interpretation of ICAO documentation and intent and what may or may not be deemed acceptable by the Montenegrin CAA was vigorously tested. Land availability and re-designation at Tivat has also, arguably, been the most significant constraining feature on the potential and realistic time phased options considered and promoted in this document. At Tivat, there is both a cemetery and environmentally sensitive nature reserve which we have avoided and sought to minimise any potential airport growth related secondary impact. At the same time, we have also sought to integrate the Plan at Tivat within the overall Spatial Planning study currently being developed.

Our approach has been dictated by a need to ensure that there is both a business rational and basis of a business or global financial appraisal behind the overall Airports Master Plan; the component phases and stages of the respective Plans and any substantial completely new, additional or modified asset. The exception to this rule has been infrastructure, such as the control tower at Tivat (the relocation of which would trigger a significant increase in investment) and the Fuel Farm at Podgorica, which APM have confirmed would be funded through a consortium or some form of public private finance initiative.

One noteworthy 'Short Term' (to c2017) development option at Tivat Airport generated considerable discussion and interest within APM. Although this

Podgorica Airport Terminal Building

option complied with the longer term vision for Tivat, it amounted to a hybrid scheme incorporating both compliant and non-compliant elements. The scheme was developed to satisfy the need to prolong the use of existing airport infrastructure whilst seeking to meet unconstrained forecast airport demand as far, and for as long as possible. Whilst satisfying some needs, it was therefore debatable when the CAA would permit such a hybrid scheme in the interest of safety, if at all. Of particular relevance however, is that the capital cost of this option was very similar to the option promoted in this document and although there were some marginal benefits there remains lingering doubt over how the CAA may view such a scheme and therefore whether it is achievable in the timescales required. Nevertheless, for completeness we have included this scheme in Appendix 4 as it may be possible to refine this scheme to an acceptable level in the very near future in parallel to advancing the preferred option. Ultimately, this is a matter for APM to justify whether they can and wish to invest the time, effort and money against the risk and opportunity afforded by pursuing certain variations to this Airports Master Plan.

3.3 Core and non-core investments

The Airports Investment Plans is focused on core investments required to meet unconstrained forecasts demand; ICAO recommendations and standards, and any other statutory or obligatory requirements.

Non-core investments generally fall into at least two broad categories; those investments that might appear 'best practise' but have no compelling reason why they should be undertaken and those that are simply 'nice to have' from a non-financial perspective.

As previously stated, our philosophy in developing the Airports Master Plan has been driven by the need to be 'compliant' in the delivery of the overall AMP and ensure that there is an underlying business rational or business case. We have challenged and sought to avoid promoting concepts which have, on balance sought 'planning' or 'operational' benefits without any cognisance of the business risks, opportunities and implications. Conversely, we have also sought to 'de-risk' the AMP by promoting options which again, on balance, are more likely to gain regulatory approval and accord with ICAO rather than run the risk of a long drawn out process with no sense of whether approval will be granted within an acceptable amount of time or effort by APM. Whilst we accept that this is a conservative approach, we have also sought to highlight certain development investment, where available, which might create more opportunity but involve a commensurate level of increased risk. Appendix 4 highlights one such example.

4 Implementation of the Short Term (2015) Investment Plans

4.1 Framework Definition

4.1.1 Identification of Further Studies

It is recommended that AMP seek an update of the '2008 Tourism Development Strategy' to reflect current issues and challenges and matters previously noted in section 2 of this AMP. Furthermore, it is recommended that APM conduct an 'origins and destination' survey for arriving passengers to aid more detailed and accurate passenger forecasting in the future.

Podgorica Airport

It is recommended that further environmental impact analysis is undertaken by the APM during the project definition/feasibility stage for the AMP.

Tivat Airport

There are relatively more issues requiring detailed assessment at Tivat, before the timing and need for additional infrastructure can be fully understood. Tivat is located in a physical environment which is spectacular, challenging and advantageous for air passengers wishing to access the coast. It also requires careful and thoughtful environmental, safety and operational management if it is to continue to grow and thrive as a commercial airport. Accordingly, we would recommended further environmental studies so that the needs of the airport can be harmonised with the surrounding environmental and ecology.

Early dialogue is also expressly recommended with the Montenegrin CAA to optimise the timing of airport investment decisions set out in this AMP whilst maintaining the highest levels of safety, security and compliance within a cost efficient investment programme.

Further work is needed to establish the business case (timing and absolute cost and benefit) and/or need associated with extending low visibility and extended summer season flight operations through the introduction of, for example, GNSS based navigation procedures and equipment. This will also require close cooperation with the Montenegrin CAA, Euro Control as well as other potential parties and study participants.

4.1.2 Strategy for procuring works and service contracts

It is recommended that APM commission a full and detailed design and technical project brief and set of specific project requirements. Careful consideration should be given to the procurement process, number of contracts and nature of the package of works to maximise value for money and overall benefit whilst minimising project related risks, environmental and safety impact, operational disruption, and compliance with EU procurement Directive.

4.1.3 PIU Role and Structure

It is imperative that APM directly or indirectly employ or commission a dedicated 'Program Implementation Unit' (PIU) to manage the timing and implementation of the Investment Programme. The PIU should consist of an individual or small team of people whose job it is to facilitate the delivery of this AMP in line with actual and forecast demand and compliance requirements, and thus safeguard the longer term interests of APM. The PIU will be responsible for creating performance measures and monitoring systems in areas such as terminal capacity and aircraft stand demand (commercial and general aviation), managing GA requirements, etc. They should monitor on a month; peak period and 'moving annual total' basis, etc data such as forecast versus actual demand and acceptable levels and breaches of capacity and service limits. These reports and measures should be reported at APM senior management level and form the basis of defining the trigger point at which point improvement and investment initiatives must be undertaken. The PIU must then prepare some preliminary forecasts indicating when those triggers are reached and when current acceptable performance levels are breached on a regular and acceptable basis to APM. The PIU should also commission or prepare initial 'Statement of Needs' for infrastructure improvements which are aligned with the current AMP and undertake research into the high level lead in timescales required to deliver those improvements, when required. Depending on APM's management structure, the PIU may also be tasked with undertaking the procurement and project management of the Investment Programme.

The PIU can assist in developing more detailed and robust data on the composition of the air passenger market at Podgorica and Tivat in terms of residence and journey purpose. This will help refine traffic forecasts for detailed business and planning purposes and when updating the next AMP (please refer to section 2.3.7).

4.1.4 Feasibility Studies Scope

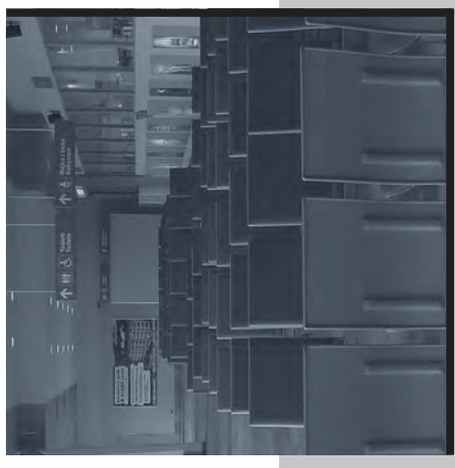
The most immediate requirement for APM is to begin the process of delivering the short term improvement plans set out in the AMP. Some of the initial tasks involve meetings with the Montenegrin CAA, Government Ministers and other policy formulators and decision makers to gain full stakeholder support.

Tivat Airport Airfield

At Podgorica, the next steps are relatively straight forward; statements of needs, project briefs and feasibility studies can now commence with clear purpose and direction. At Tivat, further discussions, particularly with the CAA are required to establish whether the short term improvements envisaged in this AMP are administered or whether a feasibility study is required to advance the case for a compromise or interim solution which might be deemed permissible and more cost effective for APM.

Additionally, the basis of the short (and long) term improvements envisaged in this AMP must be incorporated within the Spatial Planning process and system for Montenegro. This will help safeguard the longer term requirements of APM and facilitate overall spatial planning and environmental integration up to 2030 and beyond.

The requirements to pursue GNSS are addressed in sub-section 5.1.3.



5 Implementation of the Long Term (2016 to 2030) Investment Plans

5.1 Framework Definition

5.1.1 Identification of Further Studies

Podgorica Airport

It is recommended that the PIU ensure that the longer term requirements for Podgorica and APM are safeguarded at national, regional and European level (once candidature is granted to the European Union). The PIU should also help better integrate the airport into the spatial planning system, for example by better representing the longer term growth, safety and operational related needs and requirements of APM, as and when public transport and surface access improvements are initiated or when plots of land adjoining the airport are designated, expanded and developed.

Tivat Airport

One of the most important tasks is to ensure that the future growth potential at Tivat is not hampered by the lack of adjoining developable land for airport use. Further work is required to acquire additional land and better integrate the future airport related needs with the spatial and planning requirements for the sub-region. This would include improved passenger access from the sea; improved road related surface access requirements; more commercially focused General Aviation services and means to make better commercial use of airport infrastructure during off-peak periods.

5.1.2 PIU Role and Responsibilities

The PIU have a very important part to play in ensuring that the longer term investment requirements are suitably timed and safeguarded to meet the needs of APM. This is in keeping with the airport operator's role and responsibility as a commercially self sufficient entity.

There are no specific longer term requirements faced at Podgorica. At Tivat, the main long term requirement is for safeguarding, re-designating (through the Spatial Planning process) and acquiring land for future airport expansion up to 2030 and beyond.

5.1.3 Forward Planning Initiatives

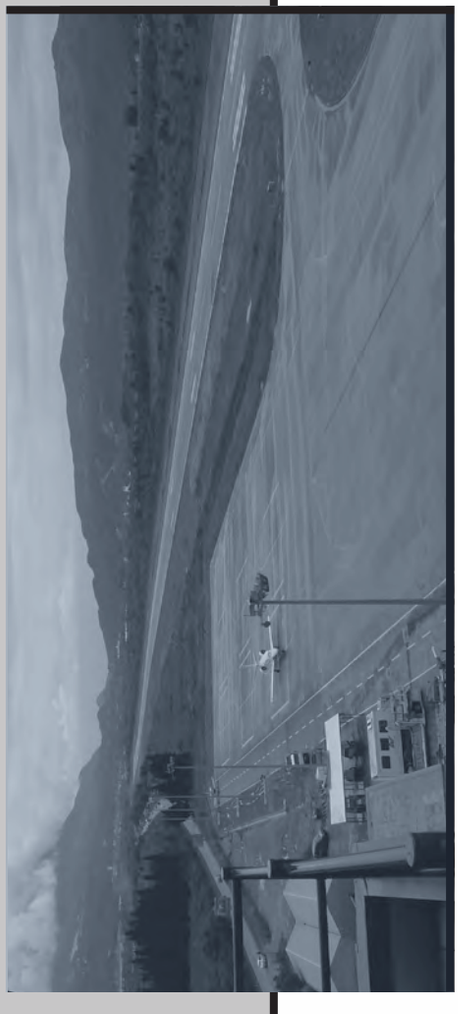
There are no particular forward planning initiatives required to be undertaken at this stage at Podgorica. This is not the case at Tivat.

Other than the partial parallel taxiway, the most significant capacity-related constraint in the short to medium term at Tivat relates to the introduction of a GNSS-based navigation solution.

Based on our preliminary studies contained in our 'Interim Report', we have concluded that the application of a GNSS-based navigation solution will offer Tivat some significant operational benefits and would allow the airport operation to be extended during reduced visibility conditions. These improvements would benefit Tivat considerably.

On the basis that the airfield and the land available to add additional airside infrastructure such as a partial or full length parallel taxiway to increase traffic throughput would prove challenging and require significant investment, an improvement in the operational approach/departure procedures through the use of GNSS would appear to offer an alternative or parallel means to seek capacity improvements in the medium to long term. Given this, it recommended that the following actions are undertaken.

- Undertake a Procedure Design Study for GNSS Approaches and Departures for Runways 14/32;
- Undertake a trial / test flight to demonstrate procedures. This could involve a specific aircraft or airline (Montenegro Airlines) to test the procedures and obtain data. This type of trial procedure has been promulgated at other airports and provides useful information to support the safety assessment and regulatory approval process;
- Set up an airline consultation committee to identify the training requirements and certification criteria required to implement such procedures;
- Set up a working group with the Airport, ATC and the National Regulator to define the certification requirements and process to be followed; and
- Define terms of reference for the different working groups and prepare a roadmap for implementation of procedures and the certification process.6.3.4. The process for implementing night time operations, namely the installation of approach, ground and obstacle lighting, at Tivat has already commenced and it is important that this continues without delay.



6 Approvals process and adoption of Airports of Montenegro Master Plan 2011

6.1 Spatial Planning process and timescale

The function of the Spatial Plan of Montenegro is to provide a strategic framework for the general spatial development of Montenegro until 2020 and to form clearly defined corridors to which sector planning and more detailed spatial planning have to move. This means that a list of priority interventions or a plan of activities cannot be part of this Plan for now.

Guidelines and recommendations for the realisation of necessary institutional adjustments; further conceptual and legal clarifications and promotion of urgently needed public investments will be provided to achieve the delivery of defined objectives. The realization of these objectives depends on the government, airport sector and local authorities.

The other function of the spatial plans is to verify sector requirements and integrate the long-term spatial development requirements of these sectors within the overall spatial development plan. For example, this would include an inter-sector approach which is in accordance with an optimum use of the space as a limited and undoubtedly non-renewable resource.

This approach often leads to:

- Conflicts between different sector requirements which have to be balanced and solved in accordance with the defined general principles and objectives of the spatial development; and
- Negligence of particular sector proposals in favour of other uses of locations and areas more appropriate for the requirements of the principles and objectives of sustainable development.

A Spatial Plan cannot replace sector policies.

According to the Law, the Spatial Plan should be elaborated and expanded upon considering programmes and strategies (including, for example, the AMP) of economic and social development as well as environmental protection. However, the challenge is to define border lines of competences between spatial planning as an inter-sector integrative approach and of sector policies.

The AMP is a strategic document which is not realized directly, but the objectives, principles and guidelines of this sector document should be taken into consideration during preparation of lower level spatial planning documents (e.g. Regional Spatial Plan, Spatial Plan for area of special purpose, Spatial Urban Plan for municipalities, detailed urban plans and state location studies, etc.) The AMP is, usually, an internal document and does not specify direct legal obligation for the planning authority on national and local level, but it should provide an expert basis for preparing drafts of planning documents.

6.2 Stages and timescale for approval and adoption of Airports Master Plan

This new AMP should be taken in consideration during the preparation of the new Spatial Urban Plan for the capital, Podgorica, together with the new Regional Spatial Plan for the coastal area. Furthermore, in the next 5 years, the AMP should also be taken into consideration in the preparation of a new Spatial Urban Plan for Tivat municipality and Spatial Plan of Montenegro.

At this point in time, this new AMP could not be incorporated into the Coastal Area Spatial Plan (Morsko dobro) and existing Spatial Urban Plan for Tivat municipality.

Appendices

Appendix 1 – Spatial Urban Plan for Tivat Municipality

Appendix 2 – Podgorica Airport - Short Term Developments

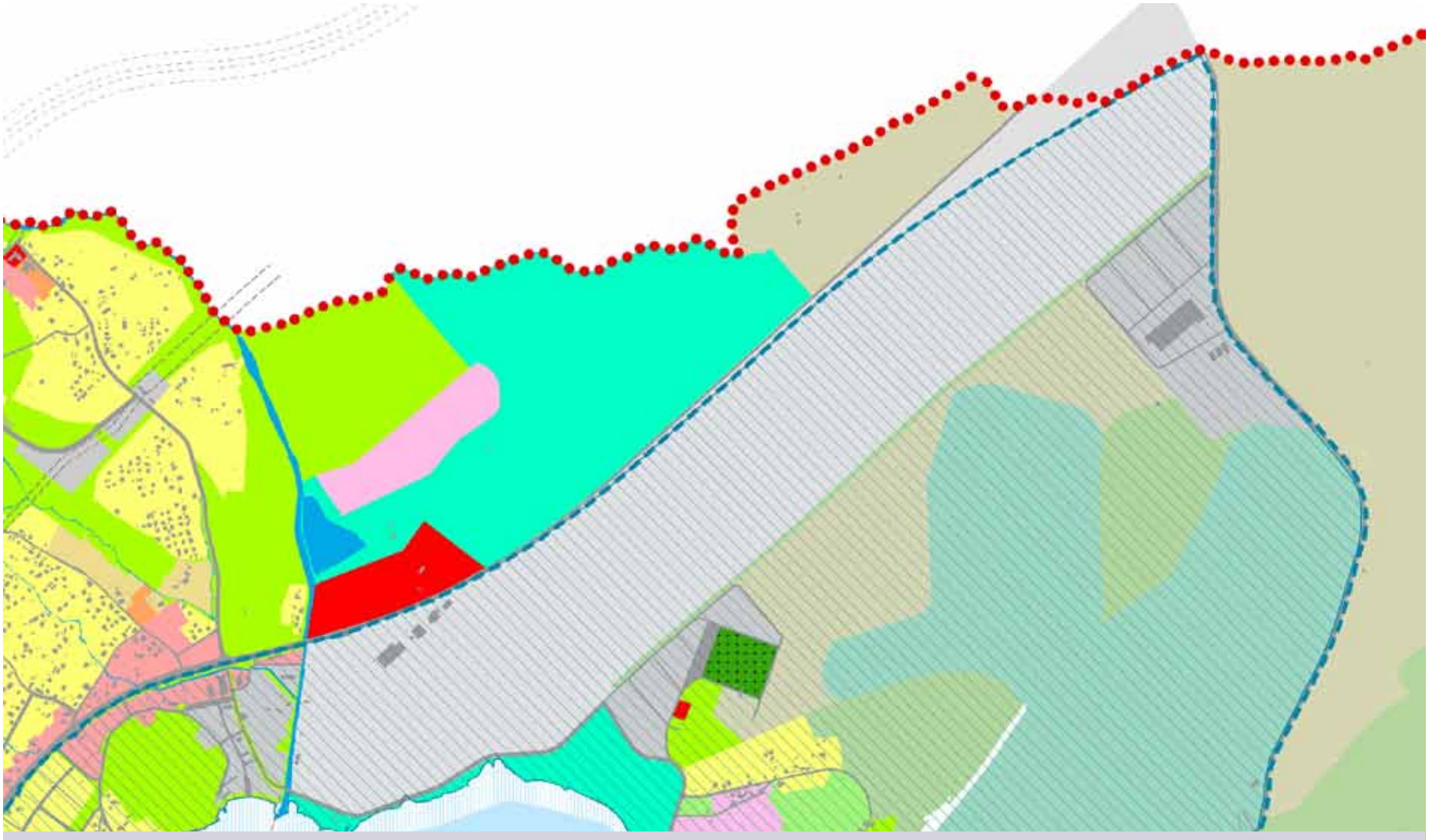
– Tivat Airport – Short Term Developments

Appendix 3 – Podgorica Airport - Master Plan 2030

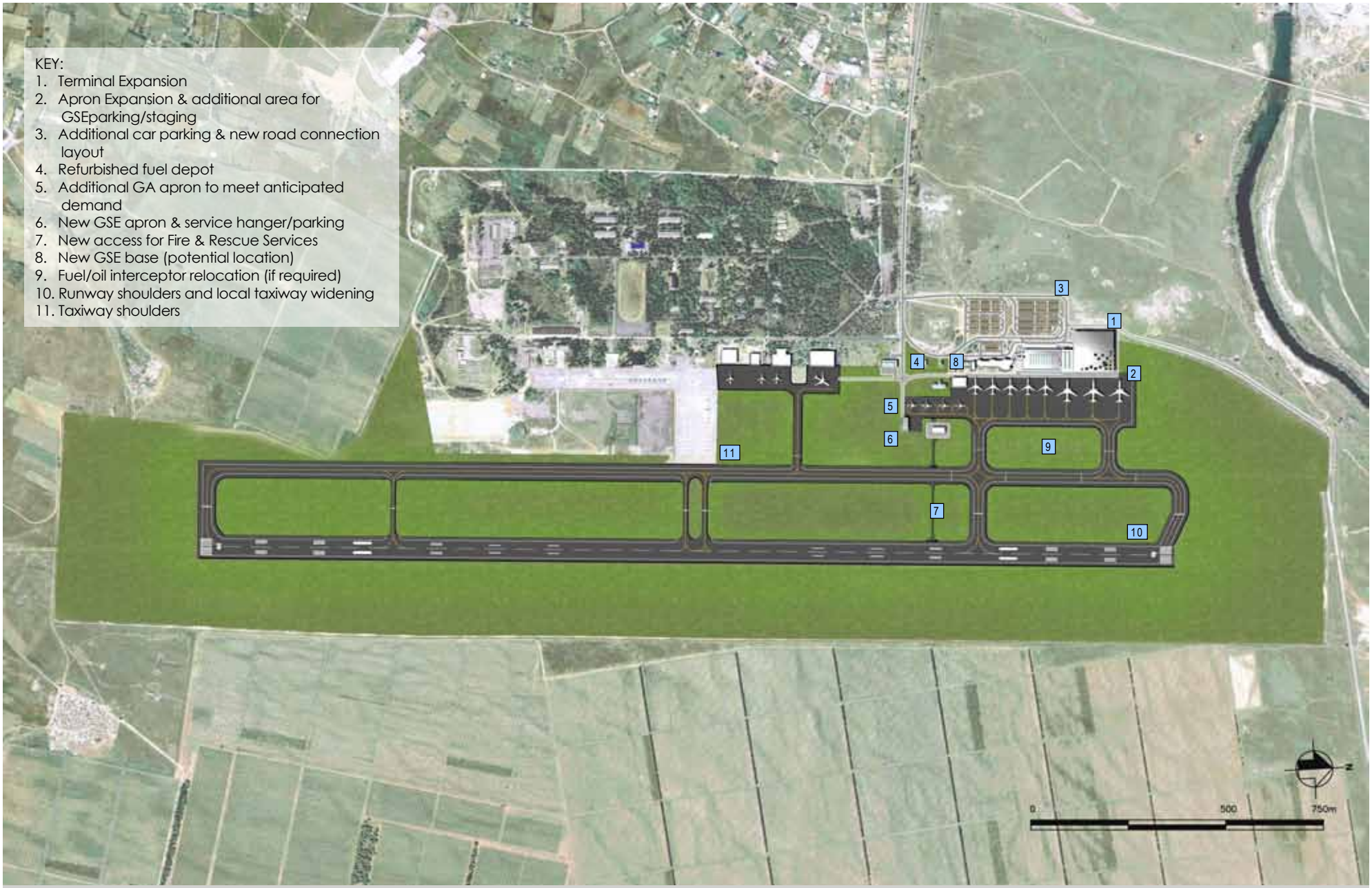
– Tivat Airport - Master Plan 2030

Appendix 4 – Alternative 'Hybrid Compliant/Non-compliant Short Term Plan for Tivat

Appendix 5 – Option evaluation – short term development options at Tivat

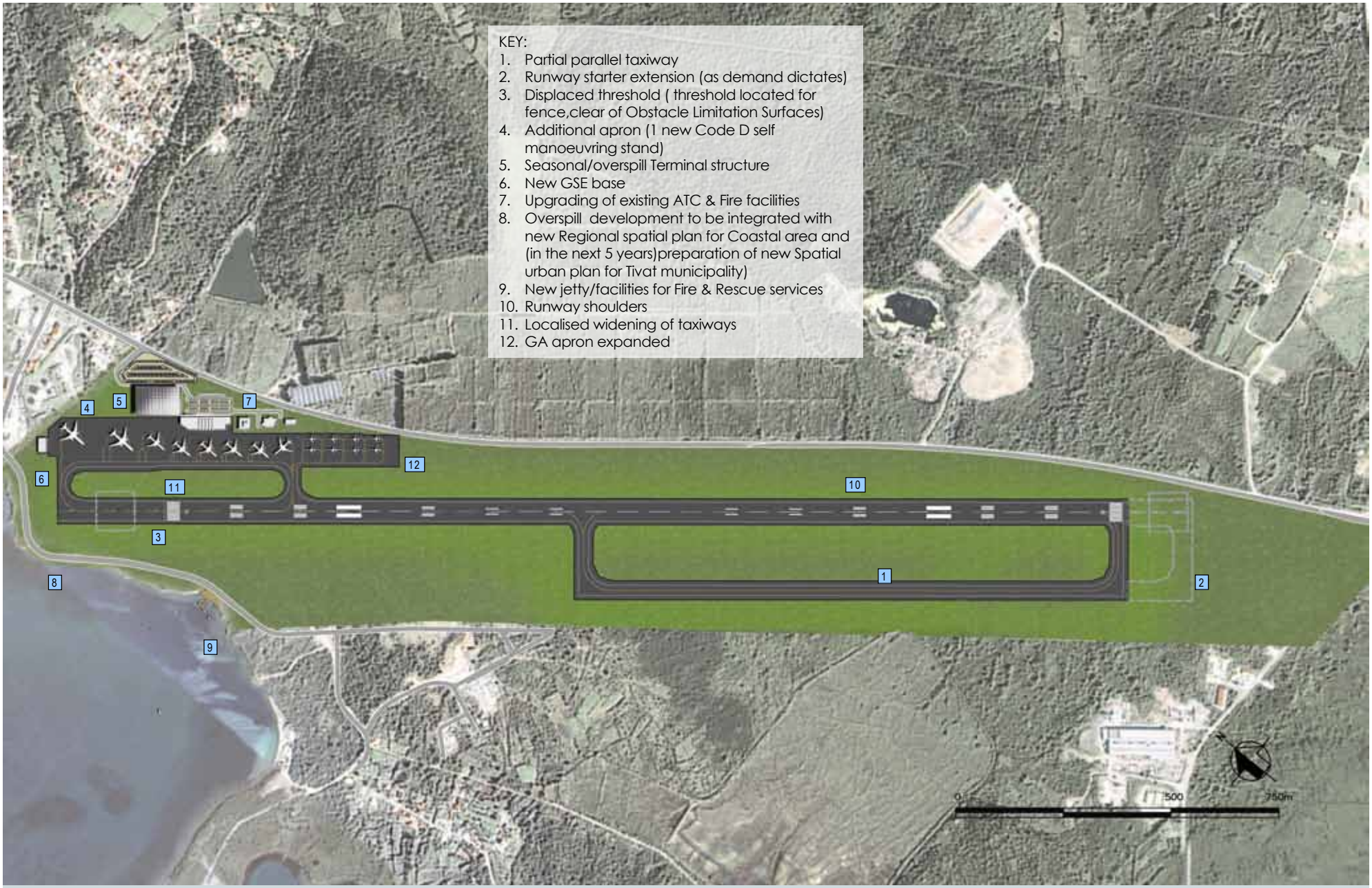


Appendix 1 – Spatial Urban Plan for Tivat Municipality



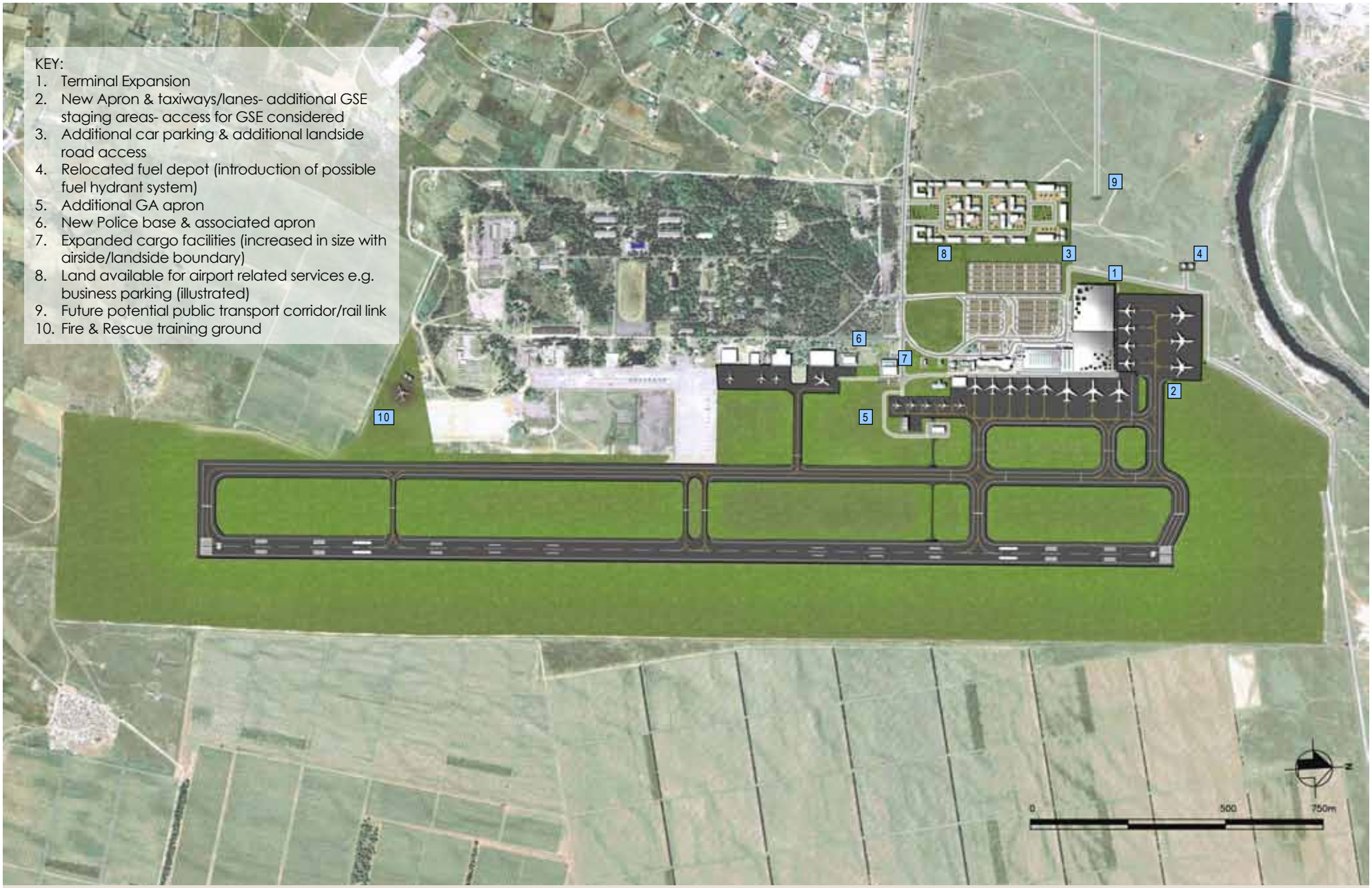
Appendix 2 - Podgorica Airport – Short Term Developments

For illustrative purposes only



Appendix 2 - Tivat Airport – Short Term Developments

For illustrative purposes only

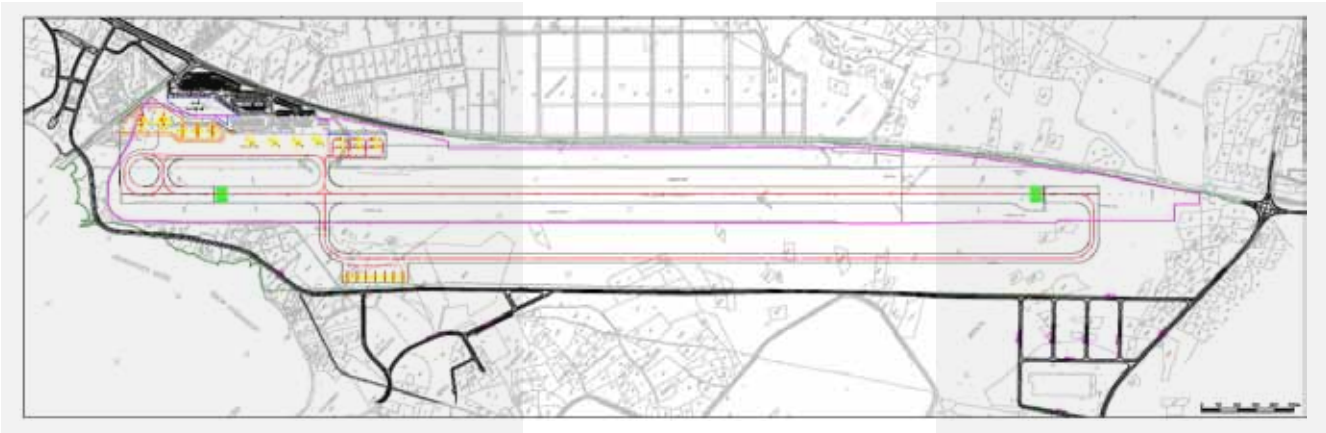


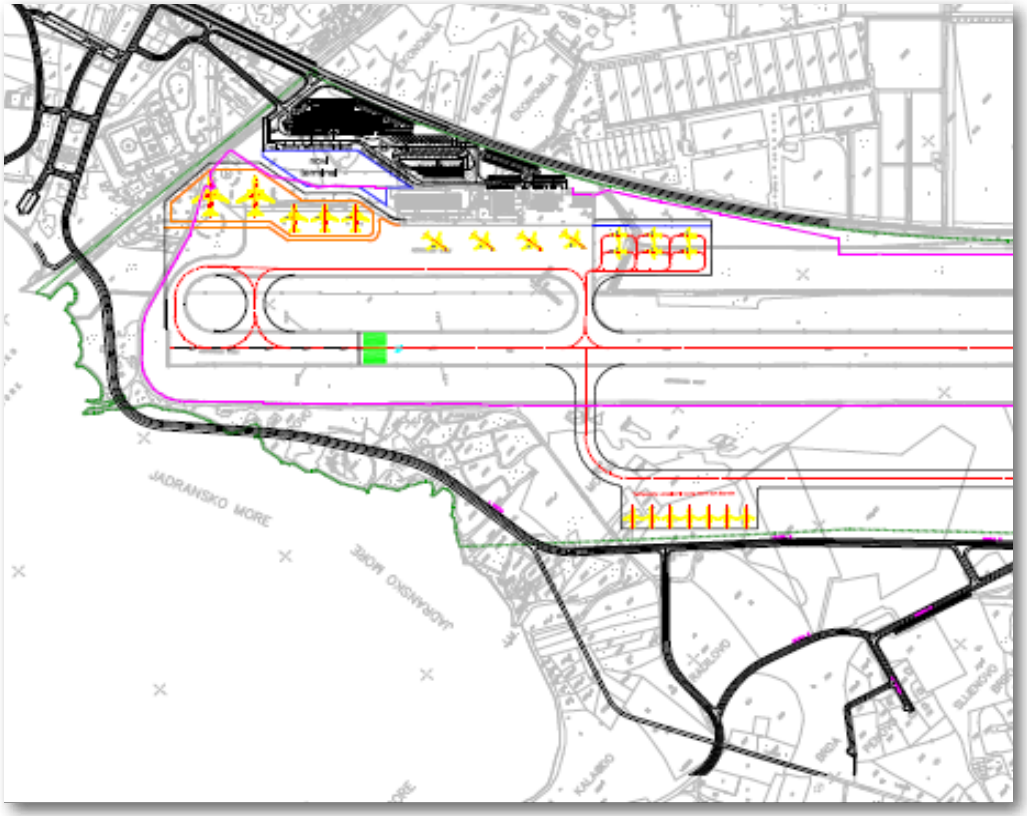
Appendix 3 - Podgorica Airport – Master Plan 2030

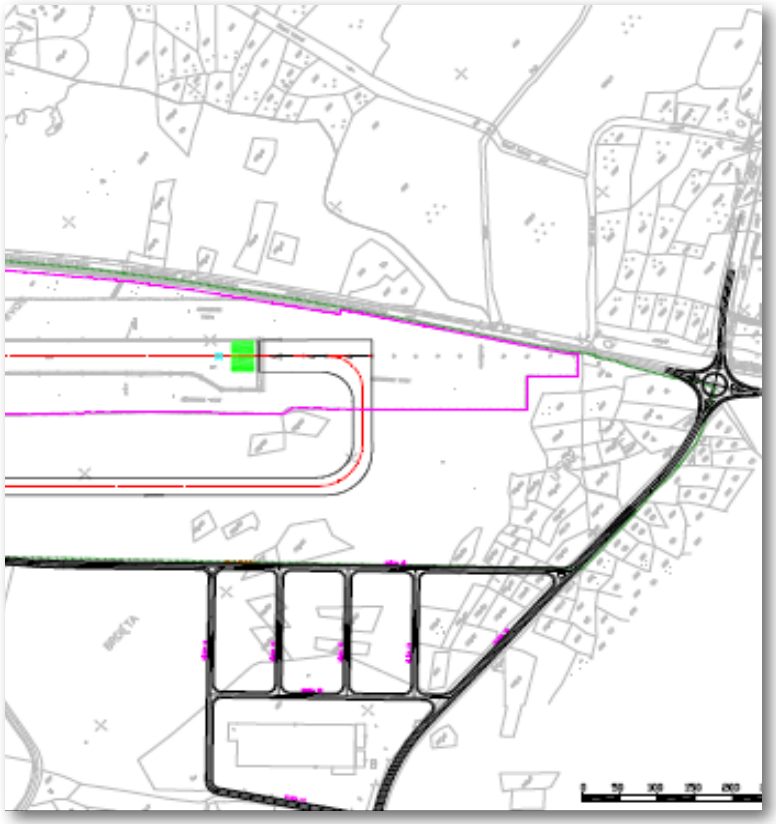
For illustrative purposes only

Appendix 3 - Tivat Airport – Master Plan 2030

For illustrative purposes only







Appendix 4 – Alternative 'Hybrid Compliant/Non-compliant Short Term Plan for Tivat

Project Title: Tivat Airport Master Plan Options

Input Cell

Short Term Development Options

Raison d'être: To deliver a phased achievable Airport Master Plan up to 2030 which is compliant with international and national regulations; meets forecast demand requirements and service quality aspirations; minimises capital and operating costs, whilst

Sub-objectives	Importance ranking compared to primary objective (scored out 100)	1 Option 1 - Do Nothing		2 Option 2 - Short Term Development (compliant)		3 Option 3 - Hybrid Option		4 Option 4 - Maintaining Status Quo (non-compliant)	
Operational Objectives	18.2	2	34.2	4	68.5	5	85.6	4	68.5
Environmental Issues	9.1	2	30.4	4	60.9	3	45.7	4	60.9
Development Flexibility	16.2	1	17.1	2	34.2	3	51.4	4	68.5
Affordability	16.2	5	90.5	3	54.3	3	54.3	4	72.4
Construction Logistics	15.2	5	62.0	4	49.6	3	37.2	4	49.6
Spatial Planning	13.1	5	52.5	4	42.0	4	42.0	4	42.0
Qualitative Aspects	12.1	2	19.0	2	19.0	4	38.0	4	38.0
Total Scores / Ranking	100.1		305.8		328.5		354.1		399.8

Appendix 5 – Option evaluation – short term development options at Tivat


MONTENEGRO

Glossary of Terms

ABAS	Any form of additional information being blended into the position calculation of aircraft is referred to by ICAO as an aircraft based augmentation system (ABAS). Often the additional avionics operate via separate principles than the GNSS and are not necessarily subject to the same sources of error or interference.
AGL	Airfield Ground Lighting
AIP	Aeronautical Information Publication. A publication issued by or with the authority of a State and containing aeronautical information of a lasting character essential to air navigation as defined by the International Civil Aviation Organization (ICAO).
ANSP	Used generically to refer to the organisation, personnel and facilities that provide separation assurance, traffic management, infrastructure management, aviation information, navigation, landing, airspace management or aviation assistance services for airspace users on behalf of a company, region or country. Can be government-owned or a private entity.
AMP	Airports (Podgorica and Tivat Airport) Master Plan
APM	Airports of Montenegro (APM) is a public enterprise company charged with managing and operating Podgorica and Tivat Airport.
ATC	Air Traffic Control
ATM	Air Transport Movement
ATS	Air Traffic Services
CIS	Commonwealth of Independent States. The CIS is a loose association of former republics of the Soviet Union as well as other nations sharing the same goals. The CIS consists of the Russian Federation; Ukraine; Republic of Belarus; Armenia, Azerbaijan, Kazakhstan, Kyrgyzstan, Moldova, Turkmenistan, Tajikistan, and Uzbekistan. Three former Soviet Republics, the Baltic states of Estonia, Latvia, and Lithuania, chose not to join; Georgia has since withdrawn.
Design Hour	The design hour represents a lower level of demand, which would normally only be exceeded around 30 times a year. Designing passenger facilities to provide the target level of service during the design hour rather than the absolute peak hour of operations represents a cost-effective compromise between congestion and the cost of meeting a level of demand that may only be experienced once a year.
DER	Departure End of the Runway
DME	Distance Measuring Equipment
EAR	European Agency for Reconstruction
EBRD	European Bank for Reconstruction and Development
EGNOS	European Geostationary Navigation Overlay Service (EGNOS) is a satellite based augmentation system (SBAS) under development by the European Space Agency, the European Commission and EUROCONTROL. It is intended to supplement the GPS, GLONASS and Galileo systems by reporting on the reliability and accuracy of the signals. The official start of operations was announced by the European Commission on 1 October 2009.
EIB	European Investment Bank
EASA	European Aviation Safety Agency (EASA) is an agency of the European Union (EU) which has been given regulatory and executive tasks in the field of civilian aviation safety.
FBO	Fixed Based Operator
FSS	Flight Service Station. Air traffic facilities which provide pilot briefing, en route communications and VFR search and rescue services, assist lost aircraft and aircraft in emergency situations, relay ATC clearances, originate Notices to Airmen, broadcast aviation weather, receive and process IFR flight plans, and monitor NavAids. In addition, at selected locations, FSSs provide En Route Flight Advisory Service (Flight Watch), take weather observations, issue airport advisories, and advise Customs and Immigration of trans-border flights.

GA	General Aviation comprising all aircraft that are not operated by commercial aviation or by the military and are 'small aircraft' (carrying around 3-4 people) as defined by APM. Also encompasses Business Aviation (or BA).
Galileo	Galileo is a global navigation satellite system (GNSS) currently being built by the European Union (EU) and European Space Agency (ESA).
GDP	Gross Domestic Product is a measure of a country's overall official economic output. It is the market value of all final goods and services officially made within the borders of a country in a year.
Glide Slope	An ILS consists of two independent sub-systems, one providing lateral guidance (localizer), the other vertical guidance (glide slope or glide path) to aircraft approaching a runway. Aircraft guidance is provided by the ILS receivers in the aircraft by performing a modulation depth comparison.
GLONASS	Global Navigation Satellite System (GLONASS) is a radio-based satellite navigation system developed by the former Soviet Union and now operated for the Russian government by the Russian Space Forces. It is an alternative and complementary to the United States' Global Positioning System (GPS), the Chinese Compass navigation system, and the planned Galileo positioning system of the European Union (EU).
GNSS	Global Navigation Satellite Systems (GNSS) is the standard generic term for satellite navigation systems ("sat nav") that provide autonomous geo-spatial positioning with global coverage.
GSE	Ground Support Equipment
ILS	Instrument Landing System: A ground based precision approach system that provides course and vertical guidance to landing aircraft.
IFR	Instrument Flight Rules. A set of rules governing the conduct of flight under instrument meteorological conditions.
IMC	Instrument meteorological conditions (IMC) is an aviation term that describes weather conditions that normally require pilots to fly primarily by reference to instruments, and therefore under Instrument Flight Rules (IFR), rather than by outside visual references under Visual Flight Rules (VFR).
IMF	The International Monetary Fund is the intergovernmental organisation that oversees the global financial system by following the macroeconomic policies of its member countries; in particular those with an impact on exchange rate and the balance of payments.
LOC	Localizer: The component of an ILS that provides course guidance to the runway.
LOS	Level of Service
L/MF	Low or Medium Frequency. Low frequency or low freq or LF refers to radio frequencies (RF) in the range of 30 kHz–300 kHz. Medium frequency (MF) refers to radio frequencies (RF) in the range of 300 kHz to 3 MHz.
MAPt	Missed approach point (MAPt or MAP) is the "point prescribed in each instrument approach at which a missed approach procedure shall be executed if the required visual reference does not exist." It defines the point for precision and non-precision approaches when the missed approach segment of a flight begins provided the runway environment is not in sight.
MLS	Microwave Landing System: an all-weather precision landing system.
NavAid	Navigational Aid. Any visual or electronic device, airborne or on the surface, which provides point-to-point guidance information or position data to aircraft in flight.
NDB	Non Directional Beacon: It is an L/MF radio station which transmits a carrier wave with identifier that can be received by an ADF (Automatic Direction Finder) receiver and an indicator in the aircraft to show the direction the station is located. It can be used to determine your own position, as a marker for an ILS procedure, locator for an airway or as backup for the VOR.
NM	Nautical Miles (1,852 metres or approximately 6,076 feet).
NPA	Approaches are classified as either precision or non-precision (NPA), depending on the accuracy and capabilities of the NavAids used. Precision approaches utilize both lateral (localizer) and vertical (glide slope) information. Non-precision approaches provide lateral course information only.
OLS	Obstacle Limitation Surface

PANS-OPS	'Procedures for Air Navigation Services - Aircraft Operations' is an ATC term denominating rules for designing instrument approach and departure procedures. Such procedures are used to allow aircraft to land and take off under IMC or IFR.
PAPI	The Precision Approach Path Indicator (PAPI) is a visual aid that provides guidance information to help a pilot acquire and maintain the correct approach (in the vertical plane) to an aerodrome or an airport. It is generally located approximately 300 meters beyond the landing threshold of the runway.
PATM	Passenger Air Transport Movement
Peak Hour	The peak hour will represent the single busiest hour of normal operations during the forecast year. For certain airport facilities, such as aircraft stand demand, the peak hour would represent the most appropriate demand criteria.
PDG	Procedural Design Gradients
PIU	Program Implementation Unit
RESA	A runway end safety area (RESA) or runway safety area (RSA) is defined as "The surface surrounding the runway prepared or suitable for reducing the risk of damage to airplanes in the event of an 'undershoot', 'overshoot', or excursion from the runway."
RNAV	Area Navigation (RNAV) can be defined as a method of navigation that permits aircraft operation on any desired course within the coverage of station-referenced navigation signals or within the limits of a self-contained system capability, or a combination of these.
RNP	Required navigation performance (RNP) is a type of performance-based navigation (PBN) that allows an aircraft to fly a specific path between two 3-dimensionally defined points in space. RNAV and RNP systems are fundamentally similar.
SARP	Standards and Recommended Practices (SARP) are developed by ICAO and cover all technical and operational aspects of international civil aviation, such as safety, personnel licensing, operation of aircraft, aerodromes, air traffic services, accident investigation and the environment.
SBAS	A satellite-based augmentation system (SBAS) is a system that supports wide-area or regional augmentation through the use of additional satellite-broadcast messages. Such systems are commonly composed of multiple ground stations, located at accurately-surveyed points. The ground stations take measurements of one or more of the GNSS satellites, the satellite signals, or other environmental factors which may impact the signal received by the users. Using these measurements, information messages are created and sent to one or more satellites for broadcast to the end users.
SID	Standard Instrument Departures
SMATSA	Serbia and Montenegro Air Traffic Services Agency
STAR	Standard Terminal Arrival Route, ('Standard Instrument Arrival' in the UK) defines a pathway into an airport from the airway structure.
VFR (i)	Visual Flight Rules. These are rules that govern the procedures for conducting flight under visual conditions. The term "VFR" is also used in the United States to indicate weather conditions that are equal to or greater than minimum VFR requirements. In addition, it is used by pilots and controllers to indicate a type of flight plan.
VFR (ii)	Visiting Friends and Relatives is a term commonly used in the tourism or hospitality industry. VFR is a form of travel involving a visit whereby either (or both) the purpose of the trip or the type of accommodation involves visiting fiends and / or relatives.
VOR	Very High Frequency Omni Directional Range: A ground-based electronic navigation aid transmitting very high frequency navigation signals, 360 degrees in azimuth, oriented from magnetic north. Used as the basis for navigation in the National Airspace System. The VOR periodically identifies itself by Morse Code and may have an additional voice identification feature. Voice features may be used by ATC or FSS for transmitting instructions/information to pilots.

WASS	Wide Area Augmentation System (WAAS) is an air navigation aid developed by the Federal Aviation Administration of the United States to augment the Global Positioning System (GPS), with the goal of improving its accuracy, integrity, and availability. Essentially, WAAS is intended to enable aircraft to rely on GPS for all phases of flight, including precision approaches to any airport within its coverage area. The International Civil Aviation Organization (ICAO) calls this type of system a satellite-based augmentation system (SBAS).
WTTC	World Travel & Tourism Council was established in 1990 and conceived as providing a consolidated data or voice for arguably the largest service industry in the world and the biggest provider of jobs.


AERODROM TIVAT

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