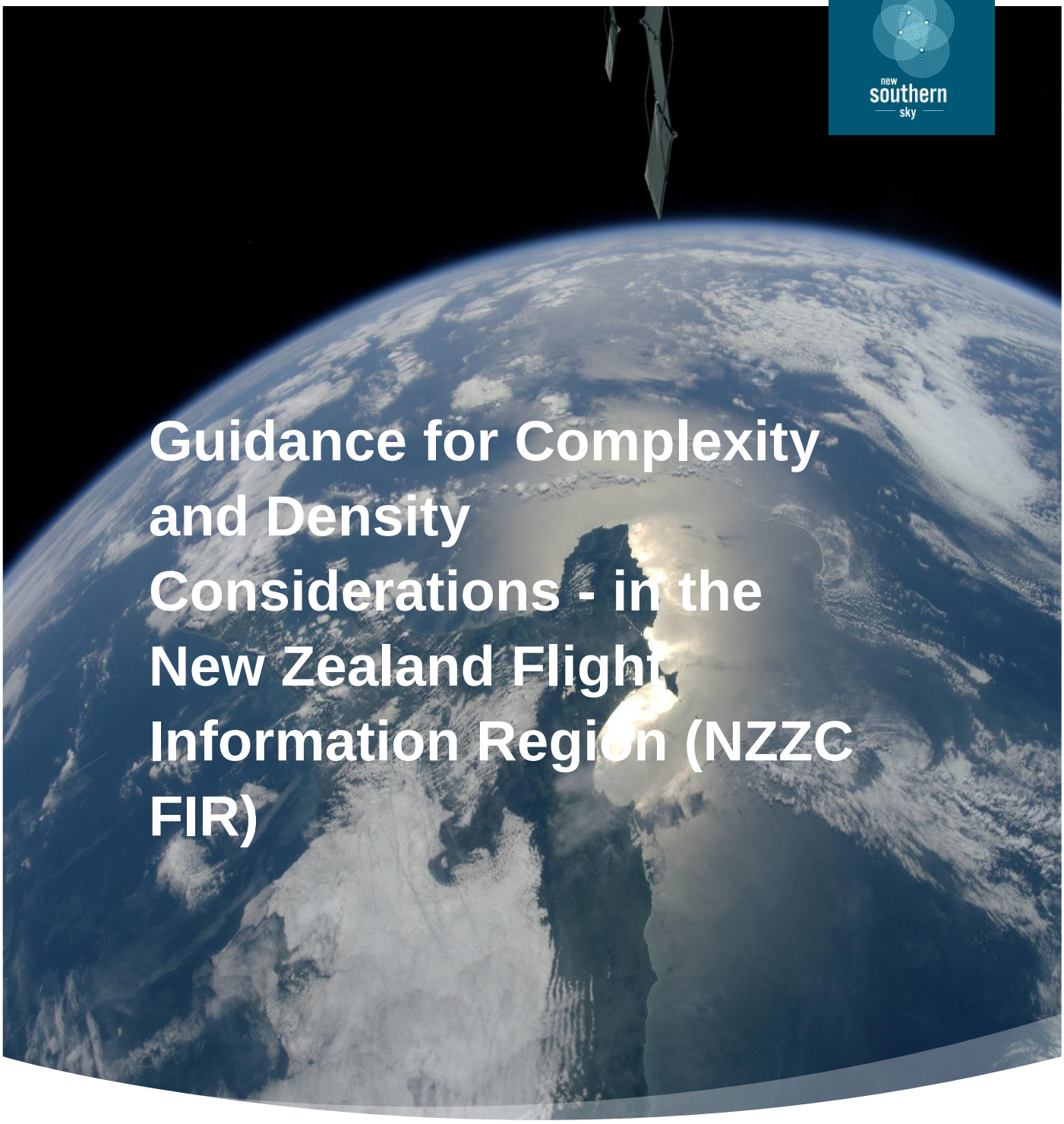

Guidance for Complexity and Density Considerations - in the New Zealand Flight Information Region (NZZC FIR)

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Director NSS
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If you have any questions relating to this guidance, please email aeronauticalservices@caa.govt.nz for further information.

Introduction

1. The Civil Aviation Authority is responsible for enabling a safe airspace environment for all commercial and recreational aviation activity, and protecting the public interest through a reliable and responsive aviation regulatory system.

2. As new technologies are introduced into the aviation sector and commercial and private user demand for airspace grows, the complexity and density of the operating environment will continue to evolve. A balanced view of the whole of system will enable the most efficient use of airspace consistent with the safe operation of aircraft and the expeditious flow of air traffic.

3. This document must not be applied as a stand-alone document, but as guidance material to support the requirements under the Civil Aviation Act, Civil Aviation Rules, National Airspace Policy of New Zealand, National Airspace and Air Navigation Plan, ICAO Annexes and Documents, and relevant Policy material. The principles to follow in decision making on airspace matters are as outlined in the National Airspace Policy of New Zealand.

4. The application of this document to diverse operational environments is to support both business as usual, as well as contributing to potential policy, regulatory, and infrastructure considerations under the umbrella of New Southern Sky (NSS) programme.

Authority

5. The Manager Aeronautical Services Unit is the owner of this document and is responsible for the regular review and maintenance of this document. The information and guidance outline within this document does not override the specific decision making functions, responsibilities and processes of the CAA as independent regulator. It will also adhere to the principles articulated within the Regulatory Operating Model and the requirements for consultation set out in Rule Part 71, which govern the designation of airspace.

6. The Complexity and Density Considerations document will provide visibility of the decision making process that may be required as the aviation system evolves in response to the introduction of new technologies. This includes but is not limited to regulatory decisions relating to:

   a. Airspace design,

   b. Air traffic management,

   c. Aerodrome infrastructure,

   d. Aircraft equipment requirements,

   e. Conventional and Global Navigational Satellite Systems (GNSS) based infrastructure

   f. Security and resilience.

7. In creating visibility of these considerations, it will also provide a platform for future project planning by industry and other government agencies as appropriate. The purpose of this platform is to guide and inform project documentation such as business case proposals and associated safety studies.

8. When industry planning documentation requires regulatory input, the CAA expects that any justification or supporting arguments will take into account the guidance contained within the complexity and density considerations document as the situation dictates. In simpler terms, on a case-by-case basis, some considerations may or may not be applicable dependent on the size and scope of any potential aviation proposal. Moreover, some elements of complexity and density may have more or less significance when considered in different contexts.

Guidance

9. A balanced view of 'whole of system' requires consideration of the various elements that contribute to the complexity and density of a piece of airspace. As each area of airspace is unique in its own right, a one-size fits all approach or a prescribed formula is likely to produce an adverse outcome. This guidance material is a tool to assist decision making in an area in which there is no fixed answer.

10. In considering each of the elements from a complementary perspective, for each unique airspace, it increases the probability of achieving the most appropriate safety outcome, with unacceptable risks reduced to an acceptable level. Using traffic volumes as the sole consideration could result in an adverse outcome. It should also be noted that some elements may not be applicable to a given area. The following high-level principles will assist in assessing complexity and density:

a. Fit for purpose: what are we trying to achieve?

b. Appropriate for the airspace: tailored to meet local requirements

c. Risk-based and safety-focused: decisions are made proportionate to the risk

d. Equitable: considers all users, including the travelling public

e. Whole of system: considers wider impacts on the local environment and the aviation system as a whole

f. Consistent: achieving a consistent level of safety across different environments

11. It is important to use relevant and reliable sources of information to enable the best possible outcome, and this should consider both current and future requirements. The quality of the information is as important as the range of information. This can include, but is not limited to:

a. Movement data;

b. ATS records from flight plans and flight progress strips;

c. Occurrence data;

d. Previous assessments;

e. Airspace modelling;

f. Industry intelligence;

g. Mapping information including geography, built-up areas, closely located aerodromes and n

h. Meteorological records;

i. Network resiliency;

j. Consultation with stakeholders and airspace users;

k. Any other relevant information.

12. The use of anecdotal evidence, assumptions or personal judgement must be clearly stated as such, and include an explanation of the logic used.

Initial assessment

13. There are a number of different scenarios that may result in the requirement for an assessment, the most common would be as the result of an aeronautical study. At the completion of an assessment by the CAA, the CAA will determine an initial outcome or outcomes. These outcomes should avoid a fragmented air navigation system and may include the determination of or a change to: the designation or classification of airspace; air, ground or space based communication, navigation or

surveillance requirements; instrument flight procedure and route development; and required services including air traffic control, systems or technology.

14. After the selection of one or more potential solutions, further analysis is required to determine the future impact of any proposed changes on each of the elements including future predicted traffic. This may necessitate further review and may alter outcomes from the initial findings.

15. For example, if an initial assessment suggests a change from controlled airspace to uncontrolled airspace however, the assessed impact of a change to the airspace designation is likely to result in significantly increased VFR traffic numbers, the end conclusion, based on the predicted outcomes, and may determine that the most appropriate outcome is not to change the airspace designation.

Complexity and Density Table

16. The table below provides guidance on elements to consider in the assessment of complexity and density and includes suggestions for classifying an element as less or more complex or dense. The intention is to apply this within the NZZC FIR.

17. For simplicity, a four scale rating system has been used as a holistic indicator of the level of complexity and density within a specific aviation environment. The suggested classifications for each element range from 0 – 3, with '0' likely to be of little or no consequence and likely to require less examination in the decision making process and '3' likely to have higher consequence requiring greater examination in the decision making process. Where, due to differing operations, an element can be classified a number of ways, the assessment should provide the context and how the classification of that element was established.

18. A balanced view of 'whole of system' will form the basis of any assessment which will include an examination of the elements, with those elements deemed likely to have a higher consequence requiring greater examination in the assessment.

19. In most cases, the listed elements do not include specific values such as traffic volumes as this will vary from location to location. For example, a specific volume of traffic may exist in a low complexity environment, that same volume of traffic might be "significant" when considered within the context of a more complex aviation environment.

Unit Procedures and Complexity and Density Considerations

20. Existing unit procedures form part of the internal regulatory function for the determination of aviation requirements, for example, airspace changes and ATS service requirements, amongst other things. In making determinations, the CAA will apply the normal regulatory process and procedures including Aeronautical Services Unit procedures, and as the situation dictates, the principles of complexity and density considerations articulated within this document.

21. Notwithstanding, the CAA will also consider other relevant and appropriate data, analyses and guidance information from domestic and international sources such as ICAO and other foreign regulatory agencies, as well as broader aviation industry experience both foreign and domestic.

	0	***1***	***2***	***3***
IFR - forecast annual traffic volumes	Nil	Low traffic density	Medium traffic density	High traffic density
VFR – forecast annual traffic volumes	Nil	Low traffic density	Medium traffic density	High traffic density
Other – forecast annual traffic volumes (e.g. parachuting, gliding, adventure aviation operations, frequent aerial topdressing, low-flying, UAVs/RPAS, rockets, etc)	Nil	Small variation or low volume of other aviation activities	Medium variation or medium volume of other aviation activities	Large variation or high volume of other aviation activities
Aerodrome traffic density (Annex 14: Note 1: The number of movements in the mean busy hour is the arithmetic mean over the year of the number of movements in the daily busiest hour; Note 2: Either a take-off or landing constitutes a movement)	Insignificant	Light. Where the number of movements in the mean busy hour is not greater than 15 per runway or typically less than 20 total aerodrome movements.	Medium. Where the number of movements in the mean busy hour is of the order of 16 to 25 per runway or typically between 20 to 35 total aerodrome movements.	Heavy. Where the number of movements in the mean busy hour is of the order of 26 or more per runway or typically more than 35 total aerodrome movements.
Peak instantaneous aircraft count, this considers airspace traffic density at peak times	Nil	Low concentration of peak traffic or limited peak traffic periods	Medium concentration of peak traffic or some peak traffic periods	High concentration of peak traffic or frequent peak traffic periods
Variety of performance categories and characteristics	All aircraft of similar performance	Aircraft of same or similar performance, with occasional variation	Regular aircraft in one or two performance categories	A wide variety of aircraft performance
Aircraft navigation performance and predictability	Aircraft have sophisticated navigation capability, performance and manoeuvrability	Low volume of aircraft have limited navigation capability, performance and manoeuvrability	Some aircraft with limited navigation capability, performance and manoeuvrability	Large number of aircraft with limited navigation capability, performance and manoeuvrability
Aircraft navigation and manoeuvrability (for example, an aircraft flying RNP-AR will have limited manoeuvrability)	Aircraft have sophisticated navigation capability, performance and manoeuvrability	Low volume of aircraft have limited navigation capability, performance and manoeuvrability	Some aircraft with limited navigation capability, performance and manoeuvrability	Large number of aircraft with limited manoeuvrability
Neighbouring airspace designation and classification and interaction with area under review	Nil	Small impact of proximity airspace designations/classifications	Medium impact of proximity airspace designations/classifications	Large impact of proximity airspace designations/classifications
Terrain, including its influence on inflight conditions	Flat terrain	Undulating terrain with limited impact on flight conditions	Terrain which impacts inflight conditions	Mountainous terrain creating significant mountain wave activity or other significant inflight conditions

	0	***1***	***2***	***3***
Geographical features affecting navigation, these may impact IFR and VFR flights differently therefore context is required	Low number of significant geographical features	Some navigational limitations as a result of geographical features	Navigational limitations as a result of geographical features	Geographical features which significantly influence navigation (e.g. mountains affecting flight manoeuvrability)
Meteorological conditions	Insignificant local or regional weather phenomena	Some local or regional weather phenomena	Significant local or regional weather phenomena	Significant and extensive local or regional weather phenomena
Availability of meteorological information	All required meteorological data available	Some meteorological data available	Limited meteorological data available	No meteorological data available
Aerodrome	Non-certificated aerodrome	Certificated aerodrome	Secondary/Other International aerodrome (AIP AD 1.4 – 1: NZDN, NZHN, NZPM, NZRO)	Primary/Major International aerodrome (AIP AD 1.4 – 1: NZAA, NZCH, NZWN, NZQN)
Instrument Runway	Other runway	Non-precision approach runway	Precision approach runway, category I	Precision approach runway, category II or III
Physical aerodrome capacity, (note: this may vary with changing weather conditions)	Not applicable	High capacity compared to forecast volumes	Medium capacity compared to forecast volumes	Low capacity compared to forecast volumes
Aerodrome layout including runway configurations and heliports	Single runway, low traffic density	Multiple runways, including parallel and crossing runways, low traffic density	Single runway, high traffic density	Multiple runways, including parallel and crossing runways, high traffic density
Aerodrome traffic patterns, this includes aerodromes in close proximity and traffic in the vicinity, aerodrome operator limitations, day/night activity.	Insignificant traffic	Simple aerodrome traffic patterns	Complex aerodrome traffic patterns from a single aerodrome	Complex aerodrome traffic patterns from multiple aerodromes
The type of air traffic services provided including the separation minima applied	Class G: no ATS service	Class G: FIS	Class D: ATC	Class A,B,C: ATC
Surveillance – type and coverage	ADS-B surveillance supported by SSR/PSR or equivalent	Full surveillance using one technology (e.g. ADS-B or SSR)	Limited surveillance coverage	No surveillance coverage
Type of air-ground communications	Not applicable	Terminal area direct ATS-pilot communications and surveillance	En-route direct ATS-pilot communications and surveillance	Remote en-route HF or CPDLC outside the coverage of ground-based navigation aids

	0	***1***	***2***	***3***
Connectivity of En-route ATS route system: this considers the importance and structure of the ATS routes within the airspace	No ATS routes	Limited ATS route structure	ATS routes connecting certificated aerodromes	ATS routes connecting international aerodromes
The start or end of significant phases of flight (climb, descent, change of direction, etc)	Nil	Limited flight paths with significant phases of flight	Some flight paths with significant phases of flight	Multiple flight paths with significant phases of flight
Impact of noise contours and other environmental considerations	No concerns	Low volume of concerns or complaints	High volume of concerns or complaints	Environmental or other court ruling
Inflight delays	Nil	Minor delays experienced	Medium delays experienced	Major delays experienced
Search and rescue (SAR) capability, this may include access, equipment, etc	High SAR capability	Some SAR capability	Limited SAR capability	Nil
National security and resiliency requirements	Nil	Low significance	Medium significance	High significance
Occurrence data and history	No occurrences	Low risk identified	Medium risk identified	High risk identified
Other hazards and threats deemed relevant to the assessment	Nil	Risk assessment determines low risk	Risk assessment determines medium risk	Risk assessment determines high risk
Ground-based navigation aid coverage	Full coverage	Partial coverage	Limited coverage	No coverage
Availability of conventional ATS routes	Full coverage of conventional ATS routes	Some availability of conventional ATS routes	Limited availability of conventional ATS routes	No conventional ATS routes
Ground-based navigation aid coverage and impact on route operating limitation (ROL) of conventional ATS routes	Not applicable	ROL < 7,000 ft	ROL 7,000 ft ≤ 12,000 ft	ROL > 12,000 ft