



Directorate of Airspace Policy
 Head of Off-Route Airspace Section

Group Captain ATC*
 Headquarters Strike Command

7th January 2008

Reference: DAP/ORA/Hd ORA/Spadeadam Autonomous Radar Status

AUTHORISATION FOR RAF SPADEADAM TO ACQUIRE AUTONOMOUS RADAR UNIT STATUS

Reference: 3GP/2212051/3/ATC dated 8 June 05.

1. At Reference, Headquarters Strike Command sought authorisation from DAP for RAF Spadeadam to acquire autonomous radar unit status in order to support future Typhoon aircraft operations within, and in the vicinity of, the Spadeadam Electronic Warfare Tactics Range (SEWTR) (EG D510/510A). The Area Office has been in close contact with my staff and me and this letter is by means of closing the loop and to formalise the arrangements.

2. DAP grants RAF Spadeadam autonomous radar unit status, subject to the following conditions:

a. The Unit is authorised to provide an ATS inside controlled airspace as follows:

(1) **Area of Operations below FL245.**

Airway	Airspace	Levels
L602	HAVEN to NEW	Base to FL245
N601	SHAPP to Scottish TMA boundary	Base to FL245
P18	GASKO to NEW (excluding Newcastle Class D CTA/CTR)	Base to FL245
TRA005/006/007	Within the confines of TRA005/006/007 to the limit of radio and radar cover.	FL195 to below FL245



(2) **Area of Operations above FL245.** Penetration of the UIR, between FL245 to FL660, within an area bounded by:

Co-ordinates – (WGS84)	Airspace Classification
542824N 0024542W – 550530N 0031236W – 552318N 0031218W – 552700N 0030000W – 553100N 0025154W – 560006N 0024848W – 56 0000N 0000000W – 550000N 0000000W – 542824N 0024542W	C

b. The Unit is authorised to provide an ATS in the following circumstances:

(1) ATC at RAF Spadeadam provide radar services to aircraft using EG D510/510A and the SEWTR and aircraft whose sorties are associated with SEWTR operations but who are operating within the airspace defined at Para 2.

(2) Spadeadam ATC may provide an ATS to aircraft crossing TRA005 airspace (when active) and within Class G airspace below, in order to deconflict such crossing traffic from SEWTR related activity. However, Spadeadam will not provide an ATS to transit traffic within the UIR area for which autonomous radar status has been granted.

c. A Memorandum of Understanding is to be drawn up between all interested parties. Presently, the signatories are to be from ScACC, MACC, ScATCC(Mil), LATCC(Mil), BAe Systems Warton, Newcastle International Airport and RAF Spadeadam.

3. Any questions regarding this authorisation should, in the first instance, be addressed to Squadron Leader Robin Stedman, ORA2, on 020 7453 6542.

{Original Signed}

A P PLOUTARCHOU
Wing Commander
Head of Off-Route Airspace Section

235 – TYPES OF SERVICE AND SEPARATION STANDARDS**235.100 TYPES OF SERVICE**

235.100.1 The types of service that may be provided by controllers are:

- a. Radar Control.
- b. Radar Advisory Service (RAS).
- c. Radar Information Service (RIS).
- d. Procedural Service.
- e. Flight Information Service (FIS).

235.105 RADAR CONTROL

235.105.1 Radar Control is an air traffic radar service in which pilots are given mandatory instructions to enable the prescribed separation minima between aircraft to be maintained. Such mandatory instructions will generally be associated with essential details of the conflicting traffic. No changes of heading or level are to be made without prior approval of the radar controller.

Note: In Class C airspace standard separation between aircraft operating under VFR need not be applied; pilots operating under VFR are to be passed traffic information on other VFR flights and are to be given traffic avoidance advice if they request it.

235.110 RAS

235.110.1 RAS is an air traffic radar service in which the controller will provide advice necessary to maintain prescribed separation between aircraft participating in the advisory service, and in which he will pass to the pilot the bearing, distance and, if known, level of conflicting non-participating traffic, together with advice on action necessary to resolve the confliction. Where time does not permit this procedure to be adopted, the controller will pass advice on avoiding action followed by information on the conflicting traffic. Under a RAS the following conditions apply:

- a. The service will only be provided to flights under IFR irrespective of meteorological conditions.
- b. Controllers will expect the pilot to accept vectors or level allocations which may require flight in IMC. Pilots not qualified to fly in IMC should accept a RAS only where compliance with ATC advice permits the flight to be continued in VMC.
- c. There is no legal requirement for a pilot flying outside CAS to comply with instructions because of the advisory nature of the service. However, a pilot who chooses not to comply with advisory avoiding action must inform the controller. The pilot will then become responsible for initiating any avoiding action that may subsequently prove necessary.
- d. The pilot must advise the controller before changing heading or level.
- e. The avoiding action instructions which a controller may pass to resolve a confliction with non-participating traffic will, where possible, be aimed at achieving separation which is not less than 5nm or 3 000ft, except when specified otherwise by the regulating authority. However, it is recognised that in the event of the sudden appearance of unknown traffic, and when unknown aircraft make unpredictable changes in flight path, it is not always possible to achieve these minima.

▶f◀ Information on conflicting traffic will be passed until the confliction is resolved.

g. The pilot remains responsible for terrain clearance, although ATSU's providing a RAS will set a level or levels below which a RAS will be refused or terminated.

235.115 RIS

235.115.1 RIS is an air traffic radar service in which the controller will inform the pilot of the bearing, distance and, if known, the level of the conflicting traffic. No avoiding action will be offered. The pilot is wholly responsible for maintaining separation from other aircraft whether or not the controller has passed traffic information. Under RIS, the following conditions apply:

- a. The service may be requested under any flight rules or meteorological conditions.
- b. The controller will only update details of conflicting traffic, after the initial warning, at the pilot's request or if the controller considers that the conflicting traffic continues to constitute a definite hazard.
- c. The controller may provide radar vectors for the purpose of tactical planning or at the request of the pilot. However, vectors will not be provided to maintain separation from other aircraft, which remains the responsibility of the pilot. There is no requirement for a pilot to accept vectors.
- d. The pilot must advise the controller before changing level, level band or route.
- e. RIS may be offered when the provision of a RAS is impracticable.
- f. Requests for a RIS to be changed to a RAS will be accepted subject to the controller's workload; prescribed separation will be applied as soon as practicable. If a RAS cannot be provided, the controller will continue to offer a RIS.
- g. For manoeuvring flights, which involve frequent changes of heading or flight level, RIS may be requested by the pilot or offered by the controller. Information on conflicting traffic will be passed with reference to cardinal points. The pilot must indicate the level band within which he wishes to operate and is responsible for selecting the manoeuvring area but may request the controller's assistance in finding a suitable location. The controller may suggest re-positioning on his own initiative but the pilot is not bound to comply.
- h. The pilot remains responsible for terrain clearance. ATSU's providing a RIS will set a level or levels below which vectors will not be provided other than in the following circumstances:

▶(1)◀ Providing vectors to pilots performing radar to visual recoveries to an airfield in accordance with regulation 420.135.2a.

▶(2)◀ Positioning aircraft for a Short Pattern Circuit (SPC), or practice SPC, in which case controllers may provide vectors to an aircraft no lower than 500ft below levels depicted on the radar vector chart when within 10nm of the airfield.

▶(3)◀ Providing vectors to aircraft on IFR departure or departing an airfield into the RTC, when the aircraft is no lower than 500ft below levels depicted on the RVC and is within 10nm of the airfield.

Notes:

1. *Controllers are to ensure that the vector will enable an aircraft to be level at, or above, the RVC within 10nm of the airfield.*

2. *Controllers are to avoid vectoring aircraft towards higher areas of the RVC within 10nm of the airfield if this would result in the aircraft being lower than 500ft below the RVC at any stage of flight.*

3. *Under certain circumstances controllers operating at RN shore-based ATC units are exempt from the above provisions – see Annex 235C.*

▶(4)◀ A pilot in emergency, including aborting from low level, requires vectors below radar vector chart heights (or area safety altitude or pilot's own safety altitude). Under such circumstances, controllers have a clear duty of care to offer as much help as possible in the safest manner. Accordingly, the controller is to warn the pilot that 'I cannot guarantee terrain clearance' but should take account of terrain and obstacles wherever possible whilst giving vectors.

235.120 PROCEDURAL SERVICE

235.120.1 Procedural Service is a non-radar ATS in which the prescribed standard separation minima, based on reported levels and positions are applied between participating aircraft. Procedural Service is applied:

- a. For the separation of aircraft in holding patterns.
- b. When it is impracticable to provide a radar service due to radar failure or reduced radar performance.
- c. When an ATC unit is providing an approach control service to participating IFR traffic without the use of radar.

235.125 FIS

235.125.1 FIS is a non-radar service provided, either separately or in conjunction with other services, for the purpose of supplying information useful for the safe and efficient conduct of flight. Under a FIS the following conditions apply:

- a. Provision of the service includes information about weather, changes of serviceability of facilities, conditions at aerodromes and any other information pertinent to safety.
- b. The controller may attempt to identify the flight for monitoring and co-ordination purposes only. Such identification does not imply that a radar service is being provided or that the controller will continuously monitor the flight. Pilots must be left in no doubt that they are not receiving a radar service.
- c. Controllers are not responsible for separating or sequencing aircraft.
- d. Where a controller suspects, from whatever source, that a flight is in dangerous proximity to another aircraft, a warning is to be issued to the pilot. It is accepted this information may be incomplete and the controller cannot assume responsibility for its issuance at all times or for its accuracy.

235.130 APPLICATION OF SERVICES

235.130.1 ATC Services. ATC Services are to be provided to the maximum extent practicable subject only to workload, communications or equipment capability and applied in accordance with the status of the airspace within which the participating aircraft are flying.

a. **Radar Services.** Radar services are applied as follows:

▶(1)◀ **Radar Control.** Radar Control is to be applied within, or shortly before entering CAS Class A and C.

▶(2)◀ **RAS and RIS.** RAS and RIS may be applied as follows:

- (a) Below FL195 outside CAS.
- (b) At and above FL195: in NW MTA and TRAs 001-008 during published hours of activity.
- (c) At and above FL245 in EA MTA during published hours of activity.
- (d) Within active MDAs and other DAs where appropriate agreements have been made.

b. **Non-Radar Services.** Non-radar services are applied as follows:

▶(1)◀ **Procedural Service.** Procedural Service may be applied throughout UK airspace.

▶(2)◀ **FIS.** FIS is available throughout UK airspace; however, it cannot be provided as a separate service in airspace within which Radar Control or Procedural Service is mandatory.

235.130.2 Class C Airspace. The procedures for the provision of ATS in Class C airspace are in Annex 235A. This includes the procedures for provision of flight in active TRAs 001-008, FL195 to FL245.

235.130.3 Class D Airspace. Except at ScATCC (Mil), where separate regulations apply, the procedures for the provision of ATS in Class D airspace are in Annex 235B.

235.130.4 Danger Areas. When required, the type of ATS provided to participating aircraft in active Danger Areas is to be in accordance with procedures agreed and published to meet the user requirements for the particular area. The ATS provided to non-participating aircraft cleared to cross a Danger Area during its published hours of activity but clear of the hazardous activity is, subject to any appropriate limitations, to be in accordance with the UK classification of the airspace within which the area lies.

235.135 LIMITATION OF RADAR SERVICES

235.135.1 Concept. Radar services are regarded as limited if the controller cannot provide traffic separation and/or traffic information to the full extent specified in the definitions of the services and the associated conditions.

235.135.2 Circumstances. Radar services are to be limited in the following circumstances:

- a. When the aircraft is being flown close to the lateral or vertical limits of solid radar cover (see Note) or within 10 nm of the edge of the radar display.
- b. When the aircraft is close to areas of permanent echoes or weather returns.
- c. When the aircraft is being flown in areas of high traffic density.

- d. When the controller considers that the performance of his radar is suspect. ► **In addition controllers are to take account of the specific equipment limitations contained in 425.** ◀
- e. When the controller is providing a service using SSR-only outwith Class A airspace. Provision of RCS in Class A airspace using SSR-only is to be specifically authorized in accordance with regulation 601.110.4a.

Note: Primary radar 'solid cover' is generally regarded as that portion of the radar's coverage within which a target of small reflecting area (such as a Hawk) may be expected to paint satisfactorily.

235.135.3 Availability. Limited RAS and RIS may be provided in airspace where the provision of full RAS and RIS is authorized. Radar Control may be limited only in MRSAs.

235.135.4 Procedures. The following procedures apply in situations where full radar services cannot be provided:

- a. When a pilot wishes to cross CAS below FL245 as OAT, in circumstances where full Radar Control cannot be provided, the controller is to obtain a procedural crossing clearance, or vector the aircraft to an area where a crossing can be made under full Radar Control.
- b. When a limited radar service is to be provided, the controller is to warn the pilot of the circumstances causing the limitation. Where feasible, the warning is to be given before the service becomes limited. Thereafter, the pilot is expected to take the stated situation into account in his general airmanship.
- c. When RAS is limited by the density of traffic, the controller is to give the provision of prescribed separation from known traffic priority over the provision of separation from unknown traffic. When a controller cannot provide separation from traffic every effort should be made to, at least, pass traffic information to the pilot receiving the RAS. The controller may offer RIS as an alternative to the RAS, but is to unilaterally cease the RAS only in very exceptional circumstances.

235.140 PROVISION OF TRAFFIC INFORMATION TO PILOTS

235.140.1 The provision of accurate Traffic Information to pilots is fundamental to the provision of an effective ATC Service. This Traffic Information is to be passed by RT using the phraseology at 915, serial 5. Additional guidance is given in the following paragraphs.

235.140.2 In addition to the normal occasions for passing Traffic Information under RAS or RIS, controllers may also consider it prudent or even necessary, to pass Traffic Information in other circumstances. In all cases however, the information passed to the pilot should be relevant to his situation and circumstances at the time; the transmission should also contain sufficient information to accurately paint the traffic picture, as available to the controller. In Class C airspace, controllers shall pass traffic information to VFR flights on other VFR flights unless notified that the flights are operating within a formation under MARSAs.

235.140.3 When radar consoles are set to display SSR mode C information against a pressure datum of 1013 mb at all levels (eg. at some terminal units), controllers are to be fully aware of the difference between the displayed mode C (based on 1013 mb) and the actual altitude (based on RPS/QNH) or height (based on QFE) of aircraft operating close to or below the Transition Level. In such cases, particularly when there is a significant pressure difference from 1013 mb, extreme caution is to be used when referring to an aircraft's indicated level whilst passing Traffic Information.

235.140.4 When the prevailing circumstances suit the use of only approximate level information (ie slightly above/below, above/below, well above/below), the following may be used as guidance:

- a. Slightly above/below - vertical difference up to 1000ft.
- b. Above/below - vertical difference of between 1000ft and 3000ft.
- c. Well above/below- vertical difference exceeding 3000ft. (Such information would normally be irrelevant but could be of importance, eg if a high rate of climb or descent is involved).

235.145 RADAR SEPARATION STANDARDS – GENERAL

235.145.1 Correlation of Displayed Primary and SSR Data. When making routine checks of their radar displays, controllers are to ensure that the correlation of displayed primary and SSR data is maintained.

235.145.2 Mode C Responses. When SSR is used to assess vertical separation, the Mode C responses are to be continuously monitored to ensure that the vertical distance is never less than the prescribed minimum. Vertical separation using Mode C is not to be applied against aircraft transponding Mode 3/A 0000.

235.145.3 Horizontal Separation – SSR. SSR shall not be used to provide horizontal separation if a controller has any doubt about the accuracy of the position of radar returns for any reason.

235.150 RADAR SEPARATION STANDARDS – LATERAL

235.150.1 Horizontal separation based on radar exists when the distance between the centres of radar returns does not represent less than the prescribed minimum, provided that the returns do not touch or overlap. The separation criteria to be applied when providing a radar service are dependent upon the source of the radar data. Normal radar separation is to be 5nm except when the radar source is provided by NATS and NATS has specified otherwise. In addition, when the radar source is provided by NATS and beyond a range specified by NATS horizontal separation is to be increased to 10nm, although 5nm separation may be applied for aircraft flying on the same radial from a specific radar source.

235.150.2 Reduced Radar Separation – Terminal Radar. Within 40nm of the radar head, horizontal separation may be reduced to 3nm between identified aircraft if:

- a. Both aircraft are in solid radar cover.
- b. Unless both aircraft are receiving a service from the same controller, they are the subject of military to military co-ordination.
- c. The radar equipments in use provide a data update rate of 10 rpm or better (See Note).
- d. Both aircraft are below FL245 and are outside CAS other than Class D.

Note: Due to the update rate of SSR (generally 8 rpm), Reduced Radar Separation is not to be applied while operating SSR-only.

235.150.3 Application of Radar Separation. When applying radar separation, controllers are to note that:

- a. Where primary radar data is displayed, horizontal separation must be applied using the primary radar returns.
- b. Horizontal separation is not to be used between aircraft holding over the same point. However, descent clearance may be given to aircraft departing the holding point as soon as standard radar separation is seen to be established.

235.155 RADAR SEPARATION STANDARDS – VERTICAL

235.155.1 Use of Vertical Separation. Vertical separation may be used in lieu of horizontal separation in the following circumstances:

- a. Following coordination.
- b. By application of Reduced Vertical Separation (RVS).
- c. By use of SSR Mode C.
- d. By use of Class A and D deeming conventions.
- e. By use of Class C deeming conventions.

235.155.2 Co-ordination. Following co-ordination, the following vertical separation minima may be applied:

- a. Between subsonic aircraft:
 - (i) Up to FL290 – 1000ft.
 - (ii) Above FL290 – 2000ft.
- b. When one or both aircraft are supersonic:
 - (i) Up to FL450 – 2000ft.
 - (ii) Above FL450 – 4000ft.

235.155.3 Reduced Vertical Separation – Terminal Radar. Terminal controllers may apply Reduced Vertical Separation (RVS) of 500ft between military aircraft provided that:

- a. Both aircraft are within 40nm of the radar head.
- b. Both aircraft are in receipt of a service from the same controller or are the subject of military to military coordination.
- c. Both aircraft are below FL100 and outside CAS other than Class D.

Subject to their agreement, civilian pilots in receipt of RAS, or operating in Class D airspace of RAF Brize Norton or RAF Lyneham, may be provided with reduced vertical separation. The application of RVS to civil aircraft is to be exceptional rather than routine and then only when a re-route is impracticable.

235.155.4 Reduced Vertical Separation – Area Radar. Area radar controllers may apply RVSM of 1000ft within the vertical and lateral limits of airspace notified as RVSM or RVSM transition airspace provided that:

- a. Both aircraft are RVSM approved.
- b. The radar display system shows the RVSM approval status of all aircraft involved to the respective controllers and the aircraft are subject to Standing Agreement Co-ordination Procedures.
- c. Verbal co-ordination has been effected.

Note: Formation flights are considered as being non-RVSM approved, regardless of the approval status of the individual aircraft concerned. In order to ensure that RVSM is applied correctly, the RVSM approval status of the aircraft is to be included in all forms of liaison phraseology (pre-notification, handover, cleared flight path requests and co-ordination).

235.155.5 SSR Mode C. An aircraft in receipt of a radar service, whether transponding in Mode C or not, may be separated from other aircraft which are transponding in Mode C subject to the following:

- a. When the Mode C of the conflicting aircraft has been verified, the following minimum vertical separation is to be maintained:
 - ▶(1)◀ 5000ft inside CAS.
 - ▶(2)◀ 3000ft outside CAS.
- b. When the Mode C of the conflicting aircraft has not been verified and both aircraft are outside CAS:
 - ▶(1)◀ **Below FL100.** A minimum vertical separation of 3000ft is to be maintained and radar returns, however presented, are not to be allowed to merge.
 - ▶(2)◀ **FL100 and Above.** The rules in 5.b.(i) apply except that, if the conflicting aircraft's Mode C indicates it to be below FL70, radar returns may be allowed to merge.
- c. Vertical separation using Mode C is not to be applied against conflicting traffic with Mode 3/A code 0000.

235.155.6 ▶◀Class A and D Deeming Conventions.

- a. **Mode C.** If an aircraft under control is within Class A or D airspace, the following deeming conventions may be employed:
 - ▶(1)◀ When Mode C indicates a conflicting aircraft to be outside the vertical limits of CAS, radar responses may be allowed to merge provided that the Mode 3/A is not that of a unit with approval to penetrate CAS and at least 1000ft vertical separation exists. Controllers are to exercise caution when controlling aircraft crossing CAS with lateral variations in base levels to ensure separation is not eroded against traffic which is subsequently cleared by the controlling authority to cross a lower portion of CAS.
 - ▶(2)◀ When the aircraft under control is at or above FL110, any traffic transponding Mode 3/A code 7000, 7001 or 7002 without Mode C may be deemed to be outside the vertical confines of CAS and radar returns may be allowed to merge.

▶(3)◀ Standard separation is to be provided if it is known or suspected that an unknown aircraft:

- (a) Is lost or has experienced radio failure.
- (b) Has inadvertently penetrated CAS.
- (c) Is not squawking.
- (d) Is squawking Mode 3/A code 0000.
- (e) Is joining CAS.

b. **Primary Contacts within the Lateral Limits of Class A CAS.** When providing an airways crossing service within Class A, Area Radar controllers at LATCC(Mil), ScATCC(Mil) and Swanwick(Mil)¹ are authorised to deem primary contacts within the lateral limits of CAS provided that:

▶(1)◀ The aircraft receiving the crossing service is 1,000ft above the base of CAS.

▶(2)◀ The primary contact has not been notified as operating in CAS by the relevant Civil Sector.

▶(3)◀ The Operating Authority of the CAS has not delegated control of that airspace to another unit.

▶(4)◀ Standard separation is to be provided if it is known or suspected that the primary contact:

- (a) Is lost or has experienced radio failure.
- (b) Has inadvertently penetrated CAS.
- (c) Is joining CAS.

235.155.7 Class C Deeming Conventions. When an aircraft in receipt of a radar service is within Class C above FL195 (outwith active TRAs 001-008), the following deeming conventions may be employed:

a. Within the vertical and lateral limits of Class C, separation is deemed to exist between aircraft under control and either known traffic whose Mode 3/A is not that of a unit with approval to penetrate Class C or unknown traffic. Controllers are not required to give aircraft under their control within Class C instructions to maintain standard separation from such traffic with or without Mode C. However, aircraft under control at FL200, or FL250 above an active TRA, are to be passed traffic information regarding conflicting unknown traffic; the radar returns may be allowed to merge. This dispensation does not apply to aircraft within 5nm of the Class C boundary in respect of unknown traffic operating within MTAs and active TRAs.

b. Standard separation is to be provided if it is known, or suspected, that an aircraft:

▶(1)◀ Is lost or has experienced radio failure.

▶(2)◀ Has inadvertently penetrated Class C or appears likely to.

¹ Swanwick(Mil) is subsumed by LATCC(Mil) in Jan 08, located at Swanwick ATC Centre.
Edition 1

►(3)◀ Is squawking Mode 3/A code 0000 and has not been the subject of co-ordination.

235.155.8 Application of Vertical Separation. The conditions for the application of vertical separation as detailed in this regulation are summarized in the following table:

		Conflicting Traffic			
		Known Traffic in Class A & D	Known Traffic in Class C above FL195 excluding active TRAs.	Known Traffic outside CAS below FL195 or within active TRAs	Unknown traffic outside CAS below FL195 or within active TRAs
Own Traffic	In Class A & D	a. 1000ft by co-ordination b. 5000ft by use of Mode C	a. 1000ft by co-ordination b. 5000ft by use of Mode C	a. 1000ft by co-ordination b. 5000ft by use of Mode C c. 1000ft by CAS deeming.	a. 1000ft by CAS deeming
	In Class C above FL195 excluding active TRAs	a. 1000ft by co-ordination b. 5000ft by use of Mode C	a. 1000ft (2000ft above FL290) by co-ordination b. 5000ft by use of Mode C	a. 1000ft by co-ordination b. 5000ft by use of Mode C c. 1000ft by Class C deeming.	a. 1000ft by Class C deeming.
	Outside CAS below FL195 or below FL 245 within active TRA	a. 1000ft by co-ordination b. 3000ft by use of Mode C	a. 1000ft by co-ordination b. 3000ft by use of Mode C	a. 1000ft by co-ordination b. 3000ft by use of Mode C c. 500ft by RVS below FL100 (see note)	a. 3000ft by use of Mode C

Note: see 235.155.3.

235.155.9 Application of Vertical Separation During Climb/Descent. An aircraft may be instructed to climb or descend to a level previously occupied by another aircraft provided that:

- a. Vertical separation, as prescribed above already exists.
- b. The vacating aircraft is proceeding to a level that will maintain vertical separation.
- c. The controller has ascertained, in accordance with 601.115.3 or from the pilot that the vacating aircraft has left the level to be vacated.

235.155.10 Severe Turbulence. If severe turbulence is known to exist, the instruction to climb or descend to the vacated level is not to be given until the vacating aircraft is vertically displaced from that level by at least 1000ft (2000ft above FL290) in the anticipated direction.

235.160 AVOIDING ACTION

235.160.1 When the projected track of an unknown aircraft appears to conflict with that of an aircraft receiving a radar service, the pilot is to be given avoiding action in accordance with the type of service being provided.

235.165 FORMATION PROCEDURES

235.165.1 Introduction. Within a formation of aircraft the formation leader is responsible for separation between units comprising the formation. This is known as MARSAs - military accepts responsibility for separation of aircraft.

235.165.2 Formation Flights in Receipt of an ATS - Specific Requirements.

- a. Formations are to be considered as a single unit for separation purposes provided that:
 - ▶(1)◀ The formation elements are contained within one nm laterally and longitudinally, and at the same level or altitude. Within Class F and G airspace only, at the controller's discretion, these limitations may be increased to 3 nm and/or up to 1000 ft vertically.
 - ▶(2)◀ The formation, although operating outside the parameters given above, has been the subject of an AUS ACN in accordance with chapter 215 or tactical negotiation between appropriate military supervisors and civilian watch managers.
- b. When first checking in on a control frequency, formation leaders are to clearly state the number of aircraft in the formation. Controllers are to ensure that this information is obtained prior to establishing an ATS.
- c. Controllers are to clearly state the number of aircraft in a formation during all co-ordination and handover messages.
- d. When crossing CAS all aircraft in the formation are to monitor the relevant ATC frequency.

235.165.3 Formation Flights Within CAS (Classes A-E). When flying within CAS (Classes A-D) and when under a radar service within Class E, the following procedures are also to be applied:

- a. All aircraft are to fly within one nm laterally and longitudinally of each other at the same level or altitude by visual means or by use of airborne radar. Where this not possible for any reason, formations are to be split into elements separated by the prescribed ATC separation minima before entering CAS. Such elements may be either individual aircraft or smaller formations that can fly within one nm laterally and longitudinally and at the same level or altitude, each of which is to be assigned a discrete SSR code with Mode C.
- b. Prior to a formation entering CAS, controllers are to obtain a confirmation on RT that all aircraft within elements are within one nm of each other.
- c. When formations are within level flight, controllers are to obtain confirmation that all elements are at their assigned level prior to the formation entering CAS. When a formation has been cleared to climb or descend in CAS controllers are to obtain confirmation that all elements have reached the new assigned level. If the vacation of a level is relevant for the purposes of co-ordination, controllers are to obtain confirmation that all elements have vacated the level in question.
- d. Controllers may permit a formation to join up in CAS under the following circumstances:

- (1) When an aircraft is in emergency and a formation join up is essential.
- (2) Formations commencing a join-up prior to entering CAS are permitted to complete their join within CAS, when conditions allow, subject to maintaining standard separation from other aircraft. Controllers are also to give appropriate consideration to the formation's proximity to other airspace users.
- (3) Within Class C airspace, controllers may allow formations to join up; however, they are to give appropriate consideration to the formation's proximity to UARs and other airspace users.

Additionally, all elements involved in the formation join up are to transpond Mode 3A plus C until established in formation. Once established in formation individual elements, excepting the lead aircraft, are to be instructed to squawk standby.

- e. Formations may require to split on a planned (e.g. prior to descent) or unplanned (e.g. approaching deteriorating weather or in emergency) basis. Early notification to controllers of the formation's requirements will ensure that any change in *configuration* takes place in a controlled, orderly and safe manner. Controllers may permit formation splits, planned or unplanned, in CAS giving due regard to other airspace users and co-ordination requirements.
- f. C130 station keeping equipment (SKE) formations may be exempted from the requirements of sub-para 3a and b provided that:
 - (1) Lead and tail aircraft are squawking (with Mode C).
 - (2) The flight is operating in accordance with a relevant ACN.
 - (3) Prior to the formation entering CAS, the controller has obtained a confirmation on RT that all elements are at the assigned level.
- g. With the exception of para 3f, formations that are subject to ACN action (e.g. Coronet Flights) or tactical negotiation between appropriate military supervisors and civilian watch managers should use best practice (e.g. First and last aircraft squawking), together with positive confirmation to ATC that all aircraft are established in the assigned level block.

235.165.4 Radar Services to Formations Outside CAS. A formation, with elements keeping station visually or by radar, of more than one nm length may receive a radar service outside CAS as follows:

- a. The lead aircraft should squawk Mode 3A and C. If the stream extends for 3 nm or more, the last aircraft should also squawk. For longer streams, intermediate aircraft should squawk as appropriate.
- b. Radar service is to be given to the lead aircraft only.
- c. Controllers are to identify the full extent of the stream formation during radar handovers, when effecting co-ordination and passing traffic information to other controllers.

235.165.5 Formation Join-up Procedures. Formation join-up procedures are as follows:

- a. **VMC.** Individual aircraft may rendezvous, either by ground controlled vectors, or by internal aids, with the final join-up being made visually. The initial minimum vertical separation is to be 2000ft below the formation but if the pilot is not visual with the formation when established in trail, vertical separation may be reduced to 1000ft below with the agreement of both the formation leader and the pilot of the joining aircraft. From this position, with the consent of the formation leader, the aircraft may be cleared to climb

visually and join the formation, adhering to the parameters at 235.165.1. From this point the formation leader is responsible for separation (MARSA) between the units comprising the formation until the completion of formation break-up procedures, and the controller is to address his instructions only to the formation leader.

b. **IMC.** Training formation join-ups will not normally be attempted in IMC. However, when for operational reasons IMC join-ups are essential, the following procedures are to be applied. The initial phase of the join-up may be achieved either by ground controlled vectors or by use of aircraft internal aids to a point 5nm horizontally from the formation leader and within 2000ft vertically. At this point the position of the joining aircraft is to be passed to the formation leader and confirmation obtained that he is willing to assume responsibility for separation between his aircraft, the aircraft comprising the formation and the joining aircraft. On receipt of this confirmation, the joining aircraft is to be transferred to the formation leader's discrete frequency. From this point MARSA applies. The final join-up will be completed using aircraft internal aids under the direction of the formation leader. The joining aircraft is to squawk standby when join-up is complete.

235.165.6 In-flight Procedures. When formation join-up is complete the formation is to be regarded as a single unit for separation purposes, provided it falls within the parameters laid down at 235.165. RAF formations and most USAFE formations, with the exception of tanker formations, may be stepped-down vertically from the leader and may occupy more than one flight level. It is essential that the controller providing the service is aware of the flight levels blocked by the formation and ensures that, where applicable, it falls within the Altitude Reservation (ALTRV) authorized in the AUS ACN. USAFE tanker formations use a different procedure. Should the climb to cruising level be stopped at an intermediate level, the formation will step-down at 500ft levels from the leader. However, once cruising level is achieved, the formation will stack-up at 500ft levels from the leader. Each element of the formation will be separated horizontally from the leader by one nm.

235.165.7 Formation Break-up Procedures. The controller is to determine from the formation leader when the break-up procedures should commence, the procedures to be followed and the order that aircraft will depart. The controller is to indicate to the formation leader when the break-up procedure may commence. There are 3 methods (see 235.165.6 to 235.165.8) for departing formation:

- a. Differential airspeed (USAFE preferred).
- b. Achieving vertical separation.
- c. Applying vectors.

Formation break-up procedures are to be carried out by one controlling agency only. The formation leader is responsible for separation (MARSA) between the aircraft comprising the formation until standard separation has been achieved between individual aircraft and each aircraft has been identified and placed under service. Handover of control to another ATS unit is not to be made until these actions have been completed.

235.165.8 Differential Airspeed (USAFE Preferred). Provided sufficient time is available, initial break-up is to be achieved by using differential airspeed to at least 5nm longitudinal spacing. The formation leader is to inform the controller when 5nm separation has been achieved and request individual control of aircraft within the formation. Individual aircraft are to be identified and placed under the appropriate service when separation has been notified.

Note: Approximately 140nm are required at a 10 knot differential airspeed to achieve 5nm spacing (the actual distance is dependent upon airspeed and headwind component and could vary considerably from this figure). Thus, if differential airspeed is not practical, the alternatives are either achieving vertical separation or applying radar vectors.

235.165.9 Achieving Vertical Separation. The controller is to determine from the formation leader whether individual aircraft will be climbing to a flight level above, or descending to a flight level below, the formation level to achieve standard vertical separation. With the approval of the controller, individual aircraft should depart the formation visually in the pre-notified sequence on the instructions of the formation leader, and climb or descend to the assigned flight level. The controller is to confirm that an aircraft is established at its assigned flight level, identified and placed under service, before authorising the formation leader to instruct the next aircraft to depart the formation.

235.165.10 Applying Vectors. The controller is to determine from the formation leader the vectors that individual aircraft will follow when departing the formation to achieve standard horizontal separation. With the approval of the controller, individual aircraft should depart the formation visually, in the pre-notified sequence, on the instructions of the formation leader, maintaining the assigned flight level and flying the agreed vector. When standard separation has been achieved, the controller is to identify the aircraft and place it under service before authorising the formation leader to instruct the next aircraft to depart the formation.

► 235.170 MILITARY FORMATIONS ROUTEING AS GAT

235.170.1 It has been agreed between NATS Ltd and MOD that formation flights are normally to fly as OAT and not GAT. Exceptionally, when this is not possible or practicable, a formation may file as GAT; however, crews have been made aware that this may lead to delay or re-routeing.

235.170.2 Where ATS has been delegated to NATS from an adjacent state, the military will not be able to provide a service. Civil sectors will therefore be responsible for providing a service through this area. Civil ATC may also opt to work the formation flight if it deems appropriate for reasons of safety. In such a case, the formation will be handed over to the military as soon as practicable. All procedures will be subject to specific local requirements.

Formation Flights Exiting the UK to Fly as GAT in Europe

235.170.3 Although flights will normally be OAT to the UK FIR/UIR boundary, a flight plan to join CAS at the last fix prior to the exit fix of the UK boundary will be filed and an appropriate Air Traffic Flow Management slot obtained for the civil sector containing the boundary fix. This will generate a civil flight plan that will enable continuation of GAT flight beyond the UK boundary. Where possible, the military controller is to pre-note the formation flight to the civil sector concerned at least 20 minutes before the flight's estimate for the boundary fix.

235.170.4 The military controller is to treat the formation as an OAT crosser and obtain appropriate co-ordination in order that the flight can reach the boundary fix. The military controller is to identify the flight to the civil sector as a formation and confirm its intentions; where practicable the flight should remain clear of the centreline of GAT routes for as long as possible. A request for a joining clearance at the boundary fix is to be obtained by the military controller; the civil sector will then activate the civil flight plan and pass an estimate to the adjoining ACC. The civil sector will provide a joining clearance to the military controller, along with the position at which the flight should be transferred; the military controller will then transfer the flight directly to the adjacent ACC.

Formation Flights Inbound to the UK Arriving as GAT from Europe

235.170.5 On first receipt of the inbound estimate, the civil sector will pre-note the appropriate military agency, including the squawk and time at the FIR/UIR boundary fix; the military will then provide a new squawk and frequency. The adjacent ACC will be asked to transfer the formation flight directly to the military frequency; it will not be required to change the squawk. Military ATC are to change the squawk once the flight is within UK airspace. Appropriate co-ordination is to be agreed to enable the formation to clear CAS as soon as practicable. ◀

▶235.175◀ REPORTING OF HAZARDOUS FLYING CONDITIONS

▶235.175.1◀ Reports of hazardous flying conditions received from aircraft under control of an ATSU are to be disseminated as quickly as possible in accordance with the following instructions:

a. **Action by Controllers Receiving Reports.** Controllers receiving reports of hazardous flying conditions from aircraft under their control are to note all relevant details passed by the reporting aircraft. They are to read back the information to ensure accuracy, pass details received to the watch supervisor and relay the information to other aircraft under service which are approaching the area concerned, offering re-routeing if possible.

b. **Action by Watch Supervisors.** On receipt of reports of hazardous flying conditions, watch supervisors are to:

▶(1)◀ Arrange for the display of details regarding the conditions reported and the area concerned so that, controllers are aware of the hazards involved.

▶(2)◀ Notify watch supervisors at adjacent ATSUs and, at units with a civilian element, the senior civil controller on duty, if it appears that aircraft under their control are likely to be affected.

▶235.175.2◀ Subsequent Actions. Watch Supervisors are to issue updated reports where necessary and are to cancel the warning when it can be confirmed that hazardous flying conditions no longer affect the ATSU's area of operation.

UNCONTROLLED COPY WHEN PRINTED

▶ INTENTIONALLY BLANK ◀

SPA/1015/1/Ops

Royal Air Force Station Spadeadam
CUMBRIA
CA6 7AT

Telephone: (016977) 47321 x 6384

Fax: (016977) 47321 x 7246

Sqn Ldr C C Deane
SO2 ATC Aerodrome Infrastructure & Safeguarding
HQ Air Command
High Wycombe
BUCKINGHAMSHIRE
HP14 4UE

9 January 2008

STEADINGS/GREEN RIGG/RAY WINDFARM DEVELOPMENT ISSUES

I am writing in response to the proposed windfarm developments that are to be situated close to RAF Spadeadam. The extent of the proposal raises numerous issues that I wish to address.

RAF Spadeadam is the RAF's only Electronic Warfare and Tactics Range (EWTR) and is located on the edge of Wark and Kielder Forests between Hadrian's Wall and the Scottish Borders. As well as being the largest RAF station in the UK, occupying 9600 acres on a 1000 yr lease from Lord Carlisle, it is also the youngest having opened in April 1976. RAF Spadeadam's mission is to "Replicate the Current and Emerging Ground-to-Air Threat in order to facilitate realistic training for operations in a Hostile Air Environment". The EWTR provides training for UK, USAF and NATO aircraft and aircrews by utilising a variety of equipment including real ex-German Air Force systems and a selection of emulators and simulators. The range also provides a vast array of fixed and moveable targets as well as the Wiley Sike impact area that is used for dropping 3kg and 14 kg practice bombs. The range is regularly used by almost all of the RAF's assets as well as RN Merlin and Sea King, AAC Apaches, USAF F15s and C-130s and NATO EW aircraft. The station also operates a number of remote radar sites, to spread it's influence and training capacity, and utilises the Kirkudbright training area for flares and manoeuvre training against simulated MANPADS. On a monthly basis, radar equipment is deployed to Brunton (SPACES), practising EW against RAF aircraft conducting manoeuvres off the East coast North of Newcastle.

The systems on base are maintained and operated by both RAF Engineering personnel and Serco Defence Aerospace services as part of a Multi-Activity Contract (MAC). Targets and systems from the range are frequently deployed to take part in Exercises both at home and abroad. Skyguard radars from Spadeadam also carry out LFM in the UK. RAF Spadeadam like many other stations places great importance on the active conservation of its natural history, as such there are several (five) areas on the site that are designated Sites of Special Scientific Interest, the Station is also actively involved with several conservation projects.

Aircraft can ingress the range from literally anywhere but the majority are from the North-East as they come from the Managed Danger Areas (MDAs) situated in the North Sea. Additionally they will come to Spadeadam having refuelled at Air to Air Refuelling Area(AARA) 5 or 6, all situated to the East of the range. Operational Training Area (OTA) 'E' is a common training area that aircraft will ingress and egress to and from as they use the range as part of a wider sortie profile, this OTA is situated to the North and North East of the range so entry can be either side of D512. When aircraft enter the range from the North Sea MDAs and AARAs they do so using the quickest and shortest route. This invariably means from the North East in between Newcastle Zone and D512; this saves fuel and time that can be used as part of operational training on the range rather than transit to and from the range thus benefiting the aircrews. Fast Jet aircraft will typically be conducting manoeuvres at around 450kts whilst evading a threat system. Helicopters will obviously be slower and in many cases will simply be in the hover using the terrain to mask their appearance from a threat system, this will produce a single primary radar return. Bear in mind that

MOD/2/2 (3)

a few miles to the East of the range is an area of low ground that is particularly useful for this tactic. It is important to remember that in all cases, usage of the facility is not bounded by the vertical and lateral dimensions of the published danger area. Aircraft will be conducting training both in and around the facility utilising the full performance envelope of the system they are evading eg SA6 is effective to 47 miles and 46000 ft (info available on wikipedia!!).

During normal operations, ATC at Spadeadam will have 2 or 3 dedicated controllers to man the 2 controlling positions and allow the other to be on a break. Each controller could typically work up to 4 aircraft, depending on intensity, traffic split, frequency separation etc. During the developers visit, FS Smith was working 1 x Harrier in the range vertically separated against 2 x Sea Kings in the range, 1 x Lynx transiting to Carlisle, 1 x Air Ambulance out of Carlisle on VHF.

The Ops room itself is a well-oiled machine that has an operational hierarchy. A Range Controller sits at the back of the room with access to all operational data and liaises directly with the ATC positions and his own threat co-ordinators who direct the EW system onto the aircraft. All the data concerning the mission is then electronically gathered and sent to the squadron concerned for analysis. There are 2 Flight Ops Assistants who take range bookings and provide up to date met observations. The atmosphere is quite intense during an operational sortie to ensure the aircrew achieve all of their mission objectives within their allotted time whilst flight safety is maintained throughout.

Aircraft transponder failures, whilst infrequent, occasionally occur. In this circumstance the mission will be allowed to continue, however, the threat systems will struggle to lock on to a target and the mission report will not be registered as it requires a serviceable transponder to gather the data. ATC workload increases as maintaining track ident becomes more difficult, particularly when conducting evasive manoeuvres. Such a manoeuvre may involve a steep climb or descent which means the radar return will appear almost to be a stationary target as there is little or no forward motion. Should this occur in an area of radar clutter, it would be extremely difficult to differentiate between the aircraft return and the surrounding clutter. Out of interest, the Harrier working Spadeadam when the developers were here departed the range with a U/S transponder!!

The area surrounding D510 is subject to pipeline and power line inspections and ordinarily the helicopter performing this task will 'check in' with Spadeadam ATC in case of activity. They are transponder equipped and squawk a specific code to show their status. The primary return from these aircraft is incredibly small as they move meticulously over a pipe or power line at very low level. Should they be conducting an inspection in the area of 'shadowing' then there is the potential to completely lose this return and increase the controller's workload in achieving standard separation against aircraft entering and exiting the range.

As you can see, the range relies on a useable radar picture to enable activity to commence with the minimum of interference to the aircrew. The current regulations regarding air traffic services require a controller to avoid any primary radar returns by 5nm when operating under RAS; such a restriction would have an unacceptable impact upon the operations controlled by ATC at RAF Spadeadam be it in/out of the range or transiting through the local area (a service offered to civilian light aircraft on a regular basis). I would ask that you consider all that I have mentioned when formulating a response to the developers in respect to the overall impact on RAF Spadeadam operations.

Yours sincerely,

(Original Signed)

A M GIBBINS
Flight Lieutenant
Senior Air Traffic Control Officer
RAF Spadeadam