Responses to questions and comments

Ann Arbor Council workshop

Proposed improvements at Ann Arbor Municipal Airport (ARB)

2/8/2016 .

How much will a longer runway improve the utility of critical aircraft on departure?	Cllr. Lumm

- *Standard operating procedure before any flight requires the pilot to perform a "weight and balance" calculation that includes an estimate of the necessary runway length required to safely become airborne from the departing runway based on weather conditions and runway conditions (dry, wet, snow/ice covered) at the time of departure for that particular airplane.*

- *The pilot must know how much weight attributable to fuel, passengers and baggage that can be loaded on the aircraft without violating the airplanes performance limits. Weight limits have a direct effect on the conduct of long or short flights with or without a full complement of allowable passengers and baggage. Often times the pilot will opt to first offload fuel before offloading passengers and their baggage in order to conduct a safe flight.*

- *The following illustrate for six critical aircraft, currently using ARB, how a runway extension would improve the aircraft capability. The calculations were made for air temp of 82F and zero wind. The mean monthly high temp for July in Ann Arbor is 83F. Higher ambient temperatures would degrade performance; Ann Arbor currently has about ten days/yr. when temps exceed 90F.*
    - *King Air C90– maximum take-off weight (TOW) requires 3,400ft.* ***No reduction in weight required***
    - *King Air B200GT – limited TOW 10,800lbs for 3,500ft (**1,700lb reduction**). Maximum TOW of 12,500lbs requires 3,800ft*
    - *King Air 350 – limited TOW 13,500lbs for 3,450ft (**1500lb reduction**). Maximum TOW 15,000lbs requires 4,150ft*
    - *Citation Mustang – limited TOW 8,500lbs for 3500ft (**145lb reduction**). Maximum TOW 8645lbs requires 3800ft*
    - *Citation XLS+ - limited TOW 18,450lbs for 3500ft (**1750lb reduction**). Maximum TOW 20,200lbs requires 4100ft*
    - *Citation Sovereign – limited TOW 28,000lbs for 3500ft (**2,300lb reduction**). Maximum TOW 30,300lbs requires 4000ft*

- *Using the example of the King Air 350, a reduced fuel load of 1500lbs equates to approximately two hours of fuel usage (775lbs/hr.) at high speed cruise (310kts) at an altitude of 24,000ft. Thus the effective range for that flight is reduced by 600-700 miles.*

Will extending the runway bring larger aircraft to the airport in greater numbers?	Cllr. Westphal Cllr. Lumm Mr. Yi

- *According to research of the business class jet fleet, there may be three additional business class jet airplane models that might operate fully loaded from a 4,300' runway that do not already operate from ARB's 3,500' runway. They are a Raytheon 390 Premier, Embraer Phenom 300, and Beechjet 400A/T/Hawker 400.*
- *See* ***Appendix A*** *for a detailed list of critical aircraft that may safely operate from ARB and those airplanes whose operating performance continues to place weight and balance limits from ARB with a 4,300' runway.*
- *The analysis in* ***Appendix A*** *specifically compares those business jets that could operate at a 3,500ft runway with those that might be able to use a 4,300ft runway. Under certain types of aircraft use, for example on demand air-taxi service operating under Part 135, a more stringent requirement is in place under Federal Aviation Regulations (FAR). The analysis illustrates that many aircraft would have marginal or no ability to use ARB with a 4,300ft runway.*
- *The practical weight limit of the airport is determined by the taxiways and the ramp areas which have a lower weight capacity than the runway.*
- *The wingtip separation distance between the runway and taxiway means the B-II classification will not change.*

How will aircraft be prevented from using the 150ft of abandoned paved runway? Why retain it as pavement?	Cllr. Briere Mr. McGill

- *The abandoned 150ft of runway at the north-east end is NOT a displaced threshold. It will be closed for any access by aircraft.*
- *The yellow chevrons painted on the surface are an ICAO (International Civil Aviation Organization) standard marking for pre-threshold area indicating it is not suitable for use by aircraft for taxiing, takeoff run or landing.*
- *The project will relocate the two taxiways to join RW24 at the new shifted start point of the runway. The runway end lights will be placed across the width of the runway at the shifted start point of RW24*
- *The permanent closed and abandoned 150ft of runway will serve only as part of the required 300' runway safety area for runoffs and will not be maintained to runway standards.*
- *The project will relocate the two existing connector taxiways to join RW24 at the new 150ft shifted start point of the runway. The existing connector taxiways will be physically removed to eliminate aircraft access to the 150ft abandoned runway. The runway end lights will be placed across the width of the runway at the shifted start point of RW24 which further eliminates access.*
- *Removing the pavement would add additional cost to the project without any meaningful benefit.*

What have been the overruns during 2009-2015 at ARB and across Michigan?	Cllr. Lumm

- *Between Jan 2009 and Dec 2015*
    - *There have been no officially documented runway overruns at ARB .*
    - *Queries of the ASRS*[1] *and NTSB*[2] *databases revealed only two overrun accidents in Michigan during that period, both at private airstrips.*

[1] Aviation Safety Reporting System is run by NASA to collate spontaneous reports from pilots in the interests of aviation safety
[2] National Transportation Safety Board investigates and collates official reports of incidents and accidents

Does the City's liability either increase or decrease if it approves a runway extension?	Cllr. Westphal Mr. McGill

- *The City's attorney office would be the most appropriate source for an official response to this question.*
- *The implementation of the revised 2008 Airport Layout Plan (ALP) developed as a response to specific safety questions from the City Council would be a positive factor in the defense of any litigation. The airport with a shifted and extended runway would then meet 100% of the FAA and MDOT-AERO runway design standards. There would be a need to articulate the rationale for a partial implementation of the approved ALP, for example, a 4200ft runway would still meet the FAA runway recommendation for a B-II small aircraft airport.*
- ***Appendix B** is a graphic taken from a FAA document AC 150/5300-13, pages 59-60, issued in Feb 2014 that depicts the approximate percentage of aircraft overrunning the runway which stay within a specified distance from the runway end; 85% of overruns would be contained within 800ft of the runway end.*

What is the relationship and dynamics between the two airports ARB and YIP?	Cllr. Ackerman

- *Many companies with smaller business jets currently choose to fly into Ann Arbor airport (ARB). The usefulness of an airport is illustrated by actual use. The Environmental Assessment specifically identifies the critical aircraft that use ARB more than 500 operations/yr.*

- *Willow Run Airport offers longer runways (longest is 7,543ft), multiple/crosswind runways, 24-hour FAA tower, 24-hour fire department, precision instrument approaches, US Customs, catering service, crew services, de-icing operations, ground power units and extensive maintenance facilities. ARB offers none of these services or infrastructure that is attractive and frequently required for most corporate/business aircraft.*

- *The summary table below offers a 25-year history of annual operations shows how aircraft use ARB differs from Willow Run Airport even though both are general aviation airports.*

	Total Operations			*Air Carrier, Air Taxi, Military Operations*		
	YIP	*ARB*	*Diff.*	*YIP*	*ARB*	*Diff.*
25-Year High	*185,329*	*134,554*	*50,775*	*57,626*	*2,495*	*55,131*
25-Year Average	*115,630*	*86,615*	*29,015*	*27,801*	*1,133*	*26,668*
25-Year Low	*59,402*	*57,109*	*2,293*	*11,174*	*268*	*10,906*

- *Note that the difference in annual operations between ARB and YIP is derived almost entirely from air carrier, air taxi and military operations.*

What have been the past runway extension proposals? How does this proposal differ? Is this the same proposal as made in 2008?	Cllr. Briere Mrs. Perkins

- *There were three previous proposals to extend or realign the runway.*
- *<u>None of these three previous proposals are the same as the current proposal</u>*

  - ***The 1968 plan** was 8,000' with a precision instrument approach (ILS) and city council passed a resolution approving 5,000'. Airport supporters were opposed to anything less than 8,000', MDOT would not take action to approve 5,000' until there was local agreement.*

  - ***The 1978-79 plan** was to realign the runway from the current 24/06 to a 10/28 heading and build a new 5000ft runway with an ILS approach directing traffic away from the city airspace.*

  - ***The 1994 plan** was the same as **the 1978-79 plan**.*

  - ***The 2008 plan** is different from past efforts. It retains the current runway alignment, shifts the runway 150ft and extends the final length to 4300ft. An ILS will not be installed.*

How can the quality of the EA be trusted when outdated maps and illustrations are used? The EA does not adequately address the increased risk of bird-strikes.	Mr. Yi Mrs. Wunderlich

- *All original environmental data including maps and illustrations has been updated through 2015.*
- *All engineering and environmental concerns expressed during public comment period were researched and addressed where any errors or affirmation was justified.*
- *All legal matters identified during public comment have undergone legal review and revision as necessary.*
- *MDOT has reviewed the revised draft EA document and forwarded it to the FAA for review and consideration.*
- *The risk of bird strikes does not change whether the runway is 3,500' or 4,300'. If a significant population of large birds exists within 5,000' of a runway, then the airport, completely independent of the runway length, would consider having a qualified biologist perform a Wildlife Hazard Assessment and provide recommendations.*

Is the noise evaluation based on a computer model or were any measurements taken? Why is the 65db dynamic noise level established as a marker? Is this a reasonable indicator of disturbance?	Cllr. Lumm Mr. Vincent

- *The noise evaluation was completed through an Integrated Noise Model (INM) which is the approved methodology developed by the FAA[3] to determine noise impact in the vicinity of airports.*
- *The 65 dBA DNL contour is the marker established by the FAA as the most compatible for all land uses. Residential land use is the most sensitive of all land uses.*
- *DNL (Day/Night Average Sound Level) is based on sound levels measured in decibels (dB), on the "A" weighted scale (dBA). The DNL accounts for noise levels of all individual aircraft events, the number of times those events occur and the period of day/night in which they occur.*
- *The INM takes into account the number of daytime and nighttime aircraft operations, flight paths, run-up locations, weather and climate, flight profiles and individual aircraft noise and performance information. Because of increased sensitivity to noise during nighttime hours, each aircraft operation during the nighttime is increased by 10 dB as a "penalty" to night intrusiveness.*

[3] A more detailed description is given in the Federal Aviation Regulations (FAR) Part 150

Would funding be available for a runway extension less than 800ft?	Cllr. Lumm
• *A final runway length of at least 4000ft would justify the effort and fixed costs of the planning and construction and thus is likely to receive funding based on a conversation with MDOT-Aero.* • *A final runway length of 4200ft would meet the FAA's recommended runway length for B-II small aircraft and permit most critical aircraft currently using ARB to take-off with full fuel, passenger and baggage loading (see earlier question)* • *A final runway length of 4300ft meets the MDOT-Aero goal of having a consistent runway length for all B-II airports in Michigan*	

The safety zone at the SW end of the runway will be inadequate when the runway is extended?	Mr. McGill

- *The statement is incorrect.*
    - *The required runway safety area (RSA)of 300ft beyond the end of RW24 is marked on the approved ALP*
    - *In addition to the RSA, there is a required runway protection zone (RPZ) for RW24 of 1000ft beyond the 300ft of the RSA. It is marked on the approved ALP and is fully contained within the airport property.*
- *The RSA of 300ft beyond the end of RW06 is marked on the approved ALP and is contained within the airport property. The shift of 150ft for the runway adds an additional margin of safety runoff protection for RW06. The RPZ of 1000ft extends across State St on airport property either side of the road for both what exists today as well as in the proposed plan.*

Appendix A

Appendix J

Listing of business class jet airplanes with takeoff and landing performance specifications.

Red highlighted cell indicates the airplane's performance requirements exceed given runway and, therefore, the airplane may not be able to safely operate from a 4,300' runway.

Column #1, Takeoff Distance, assuming maximum takeoff weight at sea level on standard temperature day (59F, 10C) from dry pavement.

Column #2, Landing Distance, assuming maximum land weight at sea level on standard temperature day (59F, 10C) on dry pavement.

Column #3, Adjusted for applicable Part 135 & Part 91 landing restrictions, Landing Distance 60% of given runway, assuming maximum land weight at sea level on standard temperature day (59F, 10C) on dry pavement.

Column #4, Adjusted for applicable Part 91 landing restrictions, Landing Distance 80% of given runway, assuming maximum land weight at sea level on standard temperature day (59F, 10C) on dry pavement.

Column #5, Takeoff Distance at ARB, adjusted for maximum average high July temperature (83F) assuming maximum takeoff weight at 829' mean sea level, from runway gradient dry pavement.

Column #6, Adjusted for applicable Part 135 & Part 91 landing restrictions, Landing Distance 60% of given runway, Landing Distance at ARB, adjusted for maximum average high July temperature (83F) assuming maximum takeoff weight at 829' mean sea level, from runway gradient dry pavement.

Column #7, Adjusted for applicable Part 91 landing restrictions, Landing Distance 80% of given runway, Landing Distance at ARB, adjusted for maximum average high July temperature (83F) assuming maximum takeoff weight at 829' mean sea level, from runway gradient dry pavement.

 # MFG, number of airplanes models manufactured in fleet.

Notes, year a particular model stopped being produced and other general notes about model.

Business Jet Airplane Landing and Take Off Analysis
from 4,300' Runway

TYPE OF JET	ARC	1.3 X STALL SPEED (KNOTS)	WING SPAN (FEET)	MAX T.O. WEIGHT	1 T.O. DISTANCE ISA (2)	2 LANDING DISTANCE ISA (3)	3 (2,580' - #2) Part 135.393 & 91 subpart K Landing Dist. 60% of 4,300' (2,580')	4 (3,440' - #2) Part 91 subpart K Landing Dist. 80% of 4,300' (3,440')	5 T.O. DISTANCE ARB (4)	6 (2,580' - #5) Part 135.393 Landing Dist. 60% of 4,300' (2,580')	7 (3,440' - #5) Part 91 subpart K Landing Dist. 80% of 4,300' (3,440')	# MFG	NOTES
JET AIRCRAFT THAT CAN OPERATE AT 3,500' OR HAVE OPERATED AT ARB													
AEROSPATIALE SN-601 CORVETTE (1)	B-I	118	42.2	14,550	3,051	2,953	(373)	487	3,713	(1,133)	(273)	40	ended 1977, according to FAA registration records, only 1 remaining with valid US registration (Elyria, OH)
CESSNA CITATION MUSTANG	B-I		43.2	8,645	3,110	2,380	200	1,060	3,784	(1,204)	(344)		
CESSNA 500 CITATION (1)	B-I	108	47.1	11,850	2,930	2,270	310	1,170	3,568	(988)	(128)	418	ended 1985
CESSNA 501 CITATION I/SP (1)	B-I	112	46.8	10,600	2,830	2,350	230	1,090	3,448	(868)	(8)	325	ended 1985
CESSNA 525 CITATIONJET (CJ-1)	B-I	107	46.7	10,400	3,080	2,750	(170)	690	3,748	(1,168)	(308)	430	
EMBRAER PHENOM 100	B-I		40.3	10,472	3,400	2,699	(119)	741	4,132	(1,552)	(692)		
HONDAJET HA 420	B-I		39.9	9,200	3,120	2,500	80	940	3,796	(1,216)	(356)		
CESSNA CITATION CJ4	B-II		50.9	16,950	3,300	2,665	(85)	775	4,012	(1,432)	(572)		
CESSNA 550 CITATION II	B-II	108	51.7	13,300	2,990	2,270	310	1,170	3,640	(1,060)	(200)	733	
CESSNA 550 CITATION BRAVO	B-II	112	52.2	14,800	3,250	2,974	(394)	466	3,952	(1,372)	(512)	161	
CESSNA 551 CITATION II/SP (1)	B-II	108	51.8	12,500	2,650	2,210	370	1,230	3,232	(652)	208	94	ended 1984
CESSNA 552/T-47 A	B-II	107	52.2	16,300	3,180	2,800	(220)	640	3,868	(1,288)	(428)	15	
CESSNA S550 CITATION S/II (1)	B-II	n/a	52.2	15,900	3,240	2,247	333	1,193	3,940	(1,360)	(500)	162	ended 1988
CESSNA 560 CITATION V Ultra	B-II	108	52.2	16,300	3,180	2,770	(190)	670	3,868	(1,288)	(428)	538	
CESSNA 560 CITATION ENCORE	B-II	108	52.2	16,830	3,560	2,865	(285)	575	4,324	(1,744)	(884)	25	
CESSNA 560 CITATION EXCEL	B-II	107	55.7	20,000	3,590	3,180	(600)	260	4,360	(1,780)	(920)	160	
CESSNA 680 CITATION SOVEREIGN	B-II		63.3	30,300	3,640	2,650	(70)	790	4,420	(1,840)	(980)		
DASSAULT FALCON 10	B-I	104	42.9	18,740	4,450	3,700	(1,120)	(260)				226	
LEARJET 25 (1)	C-I	137	35.6	15,500	3,937	2,953	(373)	487	4,777	(2,197)	(1,337)	373	ended 1986, now mostly used as frieght haulers, few based in YIP
LEARJET 31 (1)	C-I	124	43.1	16,500	3,410	2,870	(290)	570	4,144	(1,564)	(704)	220	ended 2003
LEARJET 45	C-I	129	47.1	20,200	4,220	3,140	(560)	300	5,117	(2,537)	(1,677)	256	
MITSUBISHI MU-300 DIAMOND (1)	B-I	109	43.5	14,630	4,300	3,200	(620)	240	5,213	(2,633)	(1,773)	111	became beechjet 400
SABRELINER 60 (1)	C-I	134	44.6	20,200	3,500	3,400	(820)	40	4,252	(1,672)	(812)	146	ended 1973, according to FAA registration records, only 20 remaining with valid US registration.
IAI ASTRA-WESTWIND 1125 (1)	C-II	126	52.8	23,500	5,300	3,500	(920)	(60)	6,413	(3,833)	(2,973)	135	became G100 in 2001

TYPE OF JET	ARC	1.3 X STALL SPEED (KNOTS)	WING SPAN (FEET)	MAX T.O. WEIGHT	1 T.O. DISTANCE ISA (2)	2 LANDING DISTANCE ISA (3)	3 (2,580' - #2) Part 135.393 & 91 subpart K Landing Dist. 60% of 4,300' (2,580')	4 (3,440' - #2) Part 91 subpart K Landing Dist. 80% of 4,300' (3,440')	5 T.O. DISTANCE ARB (4)	6 (2,580' - #5) Part 135.393 Landing Dist. 60% of 4,300' (2,580')	7 (3,440' - #5) Part 91 subpart K Landing Dist. 80% of 4,300' (3,440')	# MFG	NOTES
ADDITIONAL JET AIRCRAFT THAT COULD MARGINALLY OPERATE AT 4,300'													
RAYTHEON 390 PREMIER	B-I	120	44	12,500	3,792	3,300	(720)	140	4,603	(2,023)	(1,163)	42	
EMBRAER PHENOM 300	B-II		53.1	17,526	3,700	2,950	(370)	490	4,492	(1,912)	(1,052)		
BEECHJET 400A/T/ HAWKER 400	C-I	121	43.5	16,100	4,169	2,960	(380)	480	5,055	(2,475)	(1,615)	581	
LEARJET 23 (1)	C-I	124		12,500	4,000	4,300	(1,720)	(860)	4,853	(2,273)	(1,413)	100	ended 1966, according to FAA registration records, only 15 remaining with valid US registration.
JET AIRCRAFT THAT ARE UNLIKELY TO OPERATE AT 4,300'													
LEARJET 28/29 (1)	B-I	120	43.7	15,000	n/a	n/a						9	ended 1982
RAYTHEON/HAWKER 125-800	B-I	120	51.3	28,000	5,380	4,500	(1,920)	(1,060)				533	
SABRELINER 40 (1)	B-I	120	44.5	18,650	4,900	2,950	(370)	490				137	ended 1967
DASSAULT FALCON 20 (1)	B-II	107	53.5	28,660	5,249	3,609	(1,029)	(169)				515	ended 1988
DASSAULT FALCON 2000	B-II	114	63.5	35,800	5,249	5,249	(2,669)	(1,809)				140	
DASSAULT FALCON 50	B-II	113	61.9	37,480	4,593	3,609	(1,029)	(169)				310	
DASSAULT FALCON 900	B-II	100	63.4	45,500	4,921	2,297	283	1,143				190	
BAE 125-700 (1)	C-I	125	47	24,200	5,577	2,953	(373)	487				212	ended 1984
HAWKER-SIDDELEY 125-400 (1)	C-I	124	47	23,300	n/a	n/a						291	ended 1974
HAWKER-SIDDELEY 125-600 (1)	C-I	125	47	25,000	n/a	n/a						71	ended 1978
IAI 1121 & WESTWIND 1123/1124 (1)	C-I	130	43.3	23,500	4,840	2,460	120	980				442	ended 1987
LEARJET 24	C-I	128	35.6	13,500	4,300	5,325	(2,745)	(1,885)				257	
LEARJET 35/36 (1)	C-I	133	39.5	18,300	5,000	3,051	(471)	389				739	ended 1994
LEARJET 55 (1)	C-I	138	43.7	21,500	5,310	3,250	(670)	190				147	ended 1990
SABRELINER 75 (1)	C-I	137	44.5	23,300	5,500	3,750	(1,170)	(310)				9	ended 1981
BOMBARDIER CL-600 CHALLENGER	C-II	125	61.8	41,250	5,700	2,775	(195)	665				85	
BOMBARDIER CL-601 CHALLENGER	C-II	125	61.8	41,250	5,700	2,775	(195)	665				66	
BOMBARDIER CL-601-3A/3R CHALLENGER	C-II	125	61.8	41,250	5,700	2,775	(195)	665				194	
BOMBARDIER CL-604 CHALLENGER	C-II	125	61.8	47,600	5,700	2,775	(195)	665				180	
CESSNA 650 CITATION III/VI	C-II	131	53.3	21,000	5,200	2,925	(345)	515				241	
CESSNA 650 CITATION VII	C-II	126	53.6	23,000	4,850	3,220	(640)	220				119	
CESSNA 750 CITATION X	C-II	131	63.6	36,100	5,140	3,410	(830)	30				160	
DASSAULT FALCON 900 EX	C-II	126	63.5	48,300	5,215	2,375	205	1,065				85	
GALAXY 1126 (G200 since 2001)	C-II	140	58.2	34,850	5,500	3,500	(920)	(60)				33	
GULFSTREAM III (1)	C-II	136	77.8	68,700	5,906	3,281	(701)	159				199	ended 1986
RAYTHEON/HAWKER 125-1000 HORIZON	C-II	130	61.9	36,000	5,250	2,340	240	1,100				50	
SABRELINER 65 (1)	C-II	124	50.5	24,000	5,450	3,345	(765)	95				76	ended 1981
SABRELINER 75a180 (1)	C-II	128	50.4	24,500	4,460	3,450	(870)	(10)				72	ended 1981
BOMBARDIER BD-700 GLOBAL EXPRESS	C-III	126	94	96,000	6,300	2,700	(120)	740				85	
LEARJET 60	D-I	149	43.9	23,500	5,360	3,420	(840)	20				281	
GULFSTREAM II	D-II	141	68.8	65,300	5,500	4,450	(1,870)	(1,010)				258	
GULFSTREAM IV	D-II	149	77.8	71,780	5,250	3,281	(701)	159				469	
GULFSTREAM V	D-III	n/a	98.6	89,000	5,150	2,900	(320)	540				160	

					1	2	3 (2,580' - #2)	4 (3,440' - #2)		5	6 (2,580' - #5)	7 (3,440' - #5)		
TYPE OF JET	ARC	1.3 X STALL SPEED (KNOTS)	WING SPAN (FEET)	MAX T.O. WEIGHT	T.O. DISTANCE ISA (2)	LANDING DISTANCE ISA (3)	Part 135.393 & 91 subpart K Landing Dist. 60% of 4,300' (2,580')	Part 91 subpart K Landing Dist. 80% of 4,300' (3,440')		T.O. DISTANCE ARB (4)	Part 135.393 Landing Dist. 60% of 4,300' (2,580')	Part 91 subpart K Landing Dist. 80% of 4,300' (3,440')	# MFG	NOTES

Notes:

(1) - Aircraft is no longer manufactured.

(2) - Balanced field length requirement based upon International Standard Atmosphere (ISA) conditions. Data obtained from maunufacture's websites and Jane's Aircraft Encyclopedia.

(3) - Manufacturer landing distances based on ISA conditions.

(4) - Take off length adjusted for max mean temperature, elevation and runway gradient.

This is intended to be a comprehensive list of business jet aircraft though there may be other business jet aircraft not listed.

White	**Can operate on 4,300' runway within performance limits.**
Yellow	**Landing or take-off component of airplane that can marginally operate on 4,300' runway within performance limits.**
Red	**Landing or take-off Component of airplane performance that cannot operate on 4,300' runway within performance limits.**

Part 135.393 Large nontransport category airplanes, Landing limitations: Destination Airports, no person operating a large nontransport category airplane may take off fthat airplane at the weight that, (1) allowing for anticipated consumption of fuel and oil is greater than the weight that would allow a full stop landing within 60% of the effective legth of the most suitable runway at the destination airport, and (2) is greater than the weight allowable if hte landing is to be made on the runway (i) with the greatest effective length is still air...

Part 91 Subpart K, section 91.1037, Large transport category airplanse, turbine engine powered, destination and alternate airports: (a) no program manager or any other person may permit a turbine engine powered transport category airplane on a program flight to take off that airplane at a weight that...the weight of the airplane on arrival would exceed the landing weight in the airplane flight manual for the elevatoin of the destination or alternate airport and the ambient temperature expected at the time of landing. (b) except as provided in paragraph (c) of the section, no program manager or any other person may permit a turbine engine powered large transport category airplane...to take off that airplane...would allow a full stop landing at the intended dietination airport within 60% of the effective legth of each runway described below from a point 50 feet above the interescetion of the obstruction clearance plane and the runway. For purpose of determining the allowable landing weight at the destination airport, the following is assumed: (1) the airplane is landed on the most favaorable ru and the most favorable direction, in still air...(c) A program manager or other person flying a turbine engine powered large transport category airplane on a program flight may permit that airplane to take off at a weight in excess of that allowed by paragraph (b) of this section if all of the following conditions exist:
And:
(1) The operation is conducted in accordance with an approved Destination Airport Analysis in that person's program operating manual that contains the elements listed in §91.1025(o). (2) The airplane's weight on arrival, allowing for normal consumption of fuel and oil in flight (in accordance with the landing distance in the Airplane Flight Manual for the elevation of the destination airport and the wind conditions expected there at the time of landing), would allow a full stop landing at the intended destination airport within 80 percent of the effective length of each runway described below from a point 50 feet above the intersection of the obstruction clearance plane and the runway. For the purpose of determining the allowable landing weight at the destination airport, the following is assumed:
(i) The airplane is landed on the most favorable runway and in the most favorable direction, in still air.

Appendix B

a. ROFA. ROFAs require clearing of objects as specified in paragraph 309.

b. RSA. RSAs require clearing of objects, except for objects that need to be located in the RSA because of their function as specified in paragraph 307.

c. OFZ. OFZs require clearing of object penetrations including aircraft fuselages and tails. Frangible NAVAIDs that need to be located in the OFZ because of their function are exempted from this standard. Paragraph 308 specifies OFZ standard dimensions.

d. Runway end establishment. The runway end establishment OCSs are defined in paragraph 303 and Table 3-2. Clear penetrations or locate the runway end such that there are no penetrations.

e. NAVAIDs. Certain NAVAIDs require clearing of an associated "critical area" for proper operation. These NAVAID critical areas are depicted in Chapter 6.

f. RPZ. The RPZ clearing standards are specified in paragraph 310.

g. Marking and lighting. The adverse effects on some obstructions that are not feasible to clear may be mitigated by lighting and marking. However, operational restrictions or higher minimums may be required, or it may not be possible to establish an IAP.

307. Runway Safety Area (RSA) / Engineered Materials Arresting Systems (EMAS).

a. RSA development.

(1) Historical Development. In the early years of aviation, all aircraft operated from relatively unimproved airfields. As aviation developed, the alignment of takeoff and landing paths centered on a well-defined area known as a landing strip. Thereafter, the requirements of more advanced aircraft necessitated improving or paving the center portion of the landing strip. While the term "landing strip" was retained to describe the graded area surrounding and upon which the runway or improved surface was constructed, the primary role of the landing strip changed to that of a safety area surrounding the runway. This area had to be capable under normal (dry) conditions of supporting aircraft without causing structural damage to the aircraft or injury to their occupants. Later, the designation of the area was changed to "runway safety area" to reflect its functional role. The RSA enhances the safety of aircraft which undershoot, overrun, or veer off the runway, and it provides greater accessibility for fire-fighting and rescue equipment during such incidents. Figure 3-8 below depicts the approximate percentage of aircraft overrunning the runway which stay within a specified distance from the runway end. The current RSA standards are based on 90% of overruns being contained within the RSA. The RSA is depicted in Figure 3-5 and its dimensions are given in interactive Table 3-5.

(2) Recent Changes. FAA recognizes that incremental improvements inside full RSA dimensions can enhance the margin of safety for aircraft. This is a significant change from the earlier concept where the RSA was deemed to end at the point it was no longer graded and constructed to standards. Previously, a modification to standards could be issued if the actual, graded, and constructed RSA could not meet dimensional standards. Today, modifications to standards no longer apply to RSAs. The airport owner and the FAA must continually analyze a non-standard RSA with respect to operational, environmental, and technological changes and revise the determination as appropriate. Incremental improvements are included in the determination if they are practicable and they will enhance the margin of safety. The concept of incremental improvement obviously precludes the placing of objects within the standard RSA dimensions even if that location does not fully meet RSA standards.

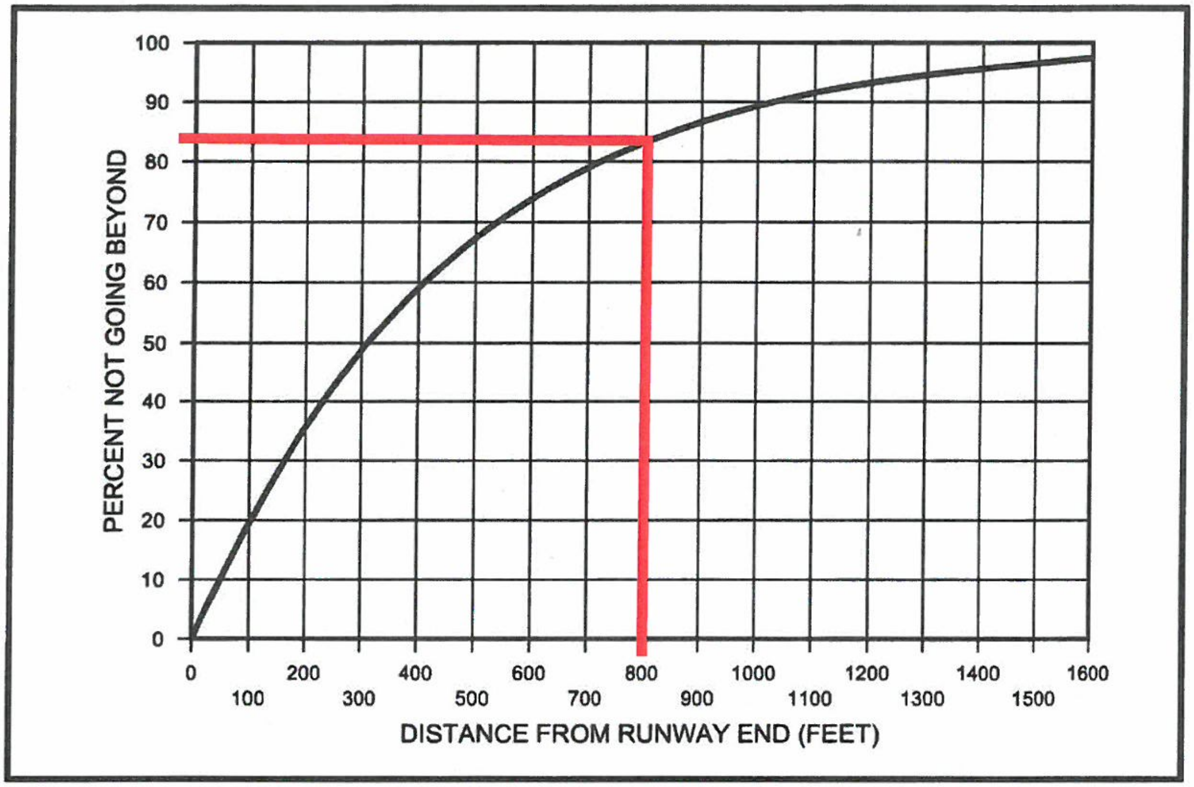

Figure 3-8. Percent of aircraft overrun versus distance beyond the runway end

b. Design standards. The RSA is centered on the runway centerline. Interactive Table 3-5 presents RSA dimensional standards. Figure 3-5 depicts the RSA. EMAS, as discussed in paragraph 307.g, is an alternative that should be considered to mitigate overruns at airports when a full-dimension RSA is not practicable due to natural obstacles, local development, and/or environmental constraints. EMAS may also be used to maximize runway length. The RSA must be:

(1) cleared and graded and have no potentially hazardous ruts, humps, depressions, or other surface variations;

(2) drained by grading or storm sewers to prevent water accumulation;