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AIR TRANSPORTATION IN NIGERIA: A SAFETY MANAGEMENT PERSPECTIVE

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Abstract

This work examined the effect of safety management/oversight on air transportation in Nigeria by considering major factors of air mishaps as pilot error, aircraft unworthiness, aircraft improper loading, adverse weather conditions, and lack of airport ambient condition.Using the E-view 8.0 software, the Ordinary Least Square (OLS) technique was used to estimate the multiple regressions of air mishaps and its antecedents. The study finds out that while pilot error, as a result of lack of competence; aircraft capacity as a result of overloading; and lack of airport ambient condition, all arising from negligence on the part of safety regulatory authorities, have significant impact on air transportation,aircraft unworthiness due to aging; and adverse weather effect owing to reduced visibility do not. The study then recommends that safety regulatory authorities be given autonomy by the government to enable them to enforcesufficiently the implementation of set standard for the efficient air transport management in Nigeria.

Introduction

In Nigeria, passengers, regulators, the public, and other stakeholders have a negative sperception about air transportation. A major reason for this as noted by Ladan (2012) is intermitted crashes (air mishaps) with the loss of eminent personalities that damaged the nation's safety record.With its category 1 rating by ICAO in 2010 and 2014 respectively, one would have expected that the Nigerian aviation has performed excellently well in safety oversight. However, the country's record of air mishaps has threatened its safety and has called into question its safety management practice.

Safety is an essential part of air transportation (Rocha, 2016), and safety management is an indispensible tool in air transportation management. It is a systematic way of managing safety. Lack of safety oversight is detrimental to an economy, as the volume of activities and benefits of air transportation could collapse with just a single accident/incident. Ciuci (2012) emphasized the need to pay close attention to air mishaps through aviation safety oversight when he opined that dwindling customers' confidence, reduction in government revenue, low profitability for airline operators, reduction in national income, low per capita income, low standard of living as well as lack of goodwill for the Nigerian Commercial Aviation are all consequences of lapses in good and adequate safety administrative practice.

Thus, this current study focused on the effect of safety oversight on air transportation by looking at some important factors(pilot error, aircraft unworthiness, aircraft improper loading, lack of airport ambient environment, and adverse weather) of air mishaps in Nigeria.

The objectives were:

(i) To ascertain if pilot error has any significant impact on air mishaps in Nigeria ;
(ii) To evaluate the significance of an aircraft condition on air mishapsin Nigeria;
(iii) To examine if lack of airport ambient environment has any significant effect on air mishapsin Nigeria;
(iv) To determine if adverse weather condition has any significant effect on air mishapsin Nigeria;
(v) To show if there is any significant relationship between aircraft improper loading and air mishapsin Nigeria.

The following null hypotheses were formulated and tested for empirical analyses.

(i) H_{01}: Pilot error has no significant impact on air mishapsin Nigeria.
(ii) H_{02}: Aircraft unworthiness has no significant effect on air mishapsin Nigeria.
(iii) H_{03}: Lack of airport ambient environment has no significant relationship with air mishapsin Nigeria.
(iv) H_{04}: Adverse weather condition has no significant relationship with air mishapsin Nigeria.
(v) H_{05}: Aircraft improper loading has no significant effect on air mishapsin Nigeria.

Literature Review

To formulate strategies to prevent air accident, the concept of accident and safety management must be properly understood. ICAO (2006), in its Annex 13 defines “Fatality” as death consequent upon the operation of an aircraft, if it occurs within 30 days of the accident.Skybrary (2014) defines Safety Management as a set of principles, framework, processes and measures to prevent accidents, injuries, and other adverse consequences that may be caused by using a service or a product. It is that function that exists to assist Managers in better discharging their responsibilities for operational system design and implementation through either the prediction of a system’s deficiencies before errors occur or the identification and correction of system’s deficiencies by professional analysis of safety occurrences. Thus, safety management implies a systematic approach to managing safety, including the necessary organizational structure, accountabilities, policies, and procedures. It is a continuous process that must be carried out with utmost diligence.

Pilot Error: This is a mistake or deliberate act of a pilot in particular and the aircrew in general leading to a mishap. Civil Aviation Authority (CAA, 1997) emphasizes skill flight handling and omission of action or inappropriate action as major forms of pilot error. Skill flight handling refers to an event in which the aircraft was controllable, but the aircrew mishandling of the aircraft or poor manual flying skills such as improper or rough handling of controls led to the catastrophic action. Omission of action or inappropriate action is generally related to flight crew continuing their descent below the decision height or minimum descent/safety heights without visual reference, failing to fly a missed approach, or omitting to set the correct configuration for take-off and failure to correctly respond to a warning (CAA, 2013). Kumar and Malik (2003) listed a number of factors that could account for pilot error as including age, flying hours, rating of the pilot, last leave period, supervisory inadequacy, visibility in kilometers, terrain, breach of discipline, poor flying skill, inexperience, and lack of situational awareness such as failure to perceive or comprehend the situation. In summary, pilot error results from lack of competence.

The Nigerian Civil Aviation Regulation (NCAR, 2009) defines competence as a combination of knowledge, attitudes and skills required to perform a task to the prescribed or set standard. Skill acquisition and knowledge come from adequate training, qualification, and experience which can help theaircrew to avoid the risk of misjudging distances, altitudes, descent rates, as well as responding incorrectly to a variety of visual/vestibular illusions.

The perception of a pilot can be influenced by adverse mental and psychological conditions, incapacitation, stress, and fatigue (Weigmann&Shappel, 2001). In this regard, Reason (1990) noted that latent errors (passive errors or errors that are not in the limelight) committed by officials within the management hierarchy directly influence the condition and decisions of pilots. Work related stress such as work overload and fatigue could occur when pilots live regimented lifestyle and are restricted to movement due to absence of leave and rest period. Gladwell (2008) explained the role of fatigue in pilot error when he wrote that in some crashes the pilot has been awake for a longtime, tired and not thinking sharply. This was the case in the Nigerian Bellview crash of 2005 where the Pilot-in-Command and the Co-pilot were in the 5th of 6 consecutive days of scheduled crew assignment when the accident occurred (Abioye, 2013). Personal problems including divorce and family instability may lead to emotional stress resulting in a pilot violating flight operational procedures.

Though pilots undergo training, and generally a pilot must be competent to be issued a license to practice, air mishaps in Nigeria have revealed a lack of competence in some cases and this is majorly as a result of lack of adequate oversight (Mikairu&Eteghe, 2012). The crash of the Nigerian Airways Flight 2120 of 1990 could have been averted if training on the DC-8 had mentioned rejecting take-off for tyres or wheel failures (Kazakage, 2012). It is the duty of Safety Administrators to ensure that individual pilots are always scrutinized for competence at all times, as safety demands this be a continuous process. This involves ensuring that pilots have the necessary training, qualification, and experience to fly, and verifying training results directly from the institutions from which they obtained such to identify any inconsistency or discrepancy that could arise as was the case with the Bellview incident of October 2005 (Kazakage, 2012). Adequate and sound safety administration also means that operational manual provided for pilots are comprehensive, free from ambiguity, specifying what pilots should do at given situations andin cases of eventuality. Deficiency in operation manual may make pilots to act inappropriately as they would be left confused as to what to do under certain eventuality as was the case with the Bellview incident (Kazakage, 2012).

Aircraft Unworthiness: To certify an aircraft as air worthy is the act of completing a maintenance release by a properly authorized person after the alteration, overhaul, repair of, inspection of an aircraft or aeronautical product by which the aircraft or aeronautical part is cleared for use in flight as meeting the requirements of airworthiness certificate of Nigeria (The NCAR, 2009). The words “Maintenance” and “Overhaul” are vividly explained by the NCAR, 2009 as necessary ingredients in aircraft worthiness.In maintaining an aircraft, the age of the aircraft becomes an important factor as inferred by Daramola (2015). Aircraft unworthiness includes maintenance issues, engine failures, malfunction of thrust, and mechanical failures such as that resulting from the aging of the aircraft as posited by Odidi (2012) when he wrote that 'the dozens of people dying through plane crashes can be brought to halt if all airlines are prepared to purchase new modern aircrafts, instead of using second-hand ones'.

NCAR, (2012) stated that whenever the State of Design considers that a condition in an aircraft airframe, aircraft engine, propeller, appliance, or component part is unsafe as shown by the issuance of an airworthiness directive by that State, the Authority will make the requirements of such directives apply to Nigerian registered civil aircrafts of the type identified in that airworthiness directive. The Authority may identify the Manufacturer's service bulletins and other sources of data, or develop and prescribe inspections, procedures and limitations for mandatory compliance pertaining to affected aircrafts in Nigeria. Thus, the role of safety administration in aircraft worthiness cannot be overemphasized. Therefore, when there is an air mishap as a result of aircraft unworthiness, the effectiveness and efficiency of the Safety Administrators is brought into question.

Jonin (2012) opined that defying the rules and compromising safety checks have led to catastrophic accidents. Whereas aircraft maintenance typically requires category A-D maintenance, Airline Operators with the consent of some officials of the NCAA cutback on maintenance especially of category C&D (overhaul and turn-around) maintenance which is not available in Nigeria. Those checks are extended or not carried out at all. Thus policies are sometimes not strictly enforced in the area of aircraft maintenance and compliance with safety standards leading to air mishaps.The crash of Sky Aviation Plane of 2002 killing 5 people on board as previously noted is an example of negligence on the part of safety regulators (AIB, 2003).

The crash of Associated Airline Flight 631 0n 3rd October, 2013 was said to be due to lack of aircraft worthiness, as the aircraft in question was 23years of age. (ThisDay, 2013). Similarly, the crash of Dana Air flight 992 a Mc Donnel Douglas M8-83 aircraft on July 3, 2012 was said to be caused by dual engine failure, since the aircraft had a persistent history of faults (Chiagozie, 2012; Aviation Nigeria, 2015). The question is "why did NCAA allow a faulty aircraft to be flown?" The answer is simply negligence.

Lack of Airport Ambient Condition: Asiegbu, Igwe, and Akekue-Alex (2012) describes ambient environment as the environment in which airlines operate including the condition of the aircraft. It includes airport facilities such as the runways, and pave-ways. Poor facilities such as unlit runways, lack of perimeter fencing and thick bush can threaten the ambience of an airport.

A properly designed airport can reduce the impact of an accident and hence reduce fatality. Shappell&Wiegman (2003) see ambient airport environmental conditions like heat, vibration, lighting, and toxins as environmental conditions affecting air mishaps. Daramola (2015) investigated aviation safety issues in Nigeria and discovered that inadequate airfield lighting and poor landing aids are still problems. Ladan (2012) spoke of decaying facilities and closure of airports as factors militating against the efficiency of the system. In recent times, government remodeled some of the Nigerian airports. This contributed to the attaining of category 1 status in 2014 for a second time (Daramola, 2015). However, some of the airports are not completely remodeled. For example a visit to the Benin-City airport reveals an uncompleted air traffic control tower. FAAN (2014) shows that of the 21 airports in Nigeria, 3 have no perimeter fencing, 9 have porous/broken fencing, 3 have either vandalized fencing or partially existing wire mesh, while just 5 have perimeter fencing in good condition. No doubt, there is still much to be done in order to enhance safety and make Nigerian airports compete equally with world renowned airports.

Adverse Weather Conditions: Adverse weather effect is another contributing cause of air accident fatalities in Nigeria. At a time, Nigeria airspace was so bad that it was branded "critically deficient". Adverse weather (reduced visibility) was named by Li & Baker (1999, 2007) as a major risk factor for crash involvement.

As suggested by Abioye (2013), a good policy on how to operate a flight during adverse weather conditionsand the use of instrument which provides different images of clouds every 15 minutes, making it easier to identify clouds that are dangerous and giving prior or advance warning to the flight crew may help in reducing adverse weather effect. This is emphasized by the report of Aviation Nigerian (2015), which revealed a six-page petition written by the National Air Traffic Controllers Association (NATCA), an umbrella body of the Air Traffic Controllers (ATC) of the NAMA stating that 'despite the fact that the Nigerian airspace was fully covered in radar, lack of functional and reliable communication facilities as prescribed by ICAO has made the airspace unsafe for users. A reasonable percentage of air safety reports made in Nigeria airspace for the past two years were communication failure, 19 of such reports being received between January and November 26, 2014. Each of these reported air incidents had the potential of resulting in mid-air collisions, making Nigeria a laughing stock among the global aviation community.' Thus, the Nigeria airspace has gradually become a nightmare for pilots flying to the country as radio communications on some routers may have collapsed (Aviation Nigeria, 2015). It is the duty of Safety Regulators to give attention to weather instrument/equipment for weather advisory services. Though weather is a natural phenomenon, with skilled personnel and sound equipments, its adverse effect can be greatly mitigated, bringing about a safer sky for flying. Thus, the acquisition of modern weather observation and forecasting technology and the training of personnel must have high priority for all the country's air carrier airports.

Aircraft Traffic Load: This isdefined by Sabreairline (2008) as 'the total weight of passengers, baggage, and cargo that an individual aircraft may safely carry'. In other words, an air traffic load could be termed aircraft capacity. An aircraft traffic load or payload must be distributed so that the aircraft's weight and balance are maintained. IVAO (2015) opined that the proper weight and balance control are vital factors for the efficient and safe operations of an aircraft. Sabreairline (2008) had earlier stated that the weigh (total mass of a loaded aircraft) and balance (the location of the centre of gravity along the longitudinal axis) are critical elements that determine the maneuverability and the stability of an aircraft for normal stall and spin characteristics. Overloading an aircraft can result in longer takeoff run and longer landing roll due to a higher takeoff speed and higher landing speed; reduced climb performance; lowered service ceiling; reduced cruising speed and shortened cruising rate; higher stalling speed and decreased maneuverability; heavy breaking and damaged tyres (IVAO, 2015). Thus, the improper loading of an aircraft can make it stall beyond control thereby having an adverse effect on flight safety.

Failure on the part of regulatory bodies to carry out their functions in this regard can lead to a failure of a flight. It is not uncommon to hear that an accident occurred as a result of an improper stalling of aircraft which could not be controlled by the pilot. It is seen that a major reason for this is the improper loading of an aircraft even in cases where the cause is said to be 'unknown'. Load planning is the first step to ensuring that an aircraft is loaded within its stated limits. It is a key safety characteristic (Sabreairline, 2008). Therefore safety regulators must diligently monitor the management functions of planning and control of an aircraft load.

Emphasizing the effect of safety oversight on air mishaps, the AIB (2009) reported that 'the analysis of accident data often reveals that the situation prior to the accident was ripe for an accident. One with safety consciousness may have been saying that it was just a matter of time before these circumstances led to an accident.' This means that a serious breach in a system's safety defense, which in most cases is created by a lack of adequate safety management/oversight, is a major determinant of air mishaps. Thus, addressing air mishaps from a safety management point of view is a necessity.

This study was based on the catastrophe theory as well as the aerodynamics theory. Safety management/oversight is a human factor. It was therefore appropriate to base this study on the catastrophe theory of accident causation by Rene Thom, which he propounded in the 1960s (Wikipedia, 2014;Zeeman, 1976). The catastrophe theory describes what happens when a change in a system brings about a change in behaviour. A callous change in aviation administration or oversight can magnify the effects of pilot error, adverse weather conditions, aircraft unworthiness, lack of ambient environment and aircraft improper loading; making such so significant in flight cancellations, delays and air mishaps. The aerodynamic theory which is based on Newton's laws of motion especially the third law by sir Isaac Newton(1642-1727) emphasizes the need to load an aircraft appropriately for proper balance and stability during flight so as to prevent it from stalling and ultimately from accident (Sabreairline, 2008).

Methodology

This research work is a longitudinal study of air mishaps in Nigeria. The study considered a 35-year period series of measurements time series data from 1980 to 2014. The study employed secondary sources of data collection. Data were obtained from Central Bank of Nigeria (CBN) statistical bulletin, Nigerian Meteorological Agency (NIMET), Accident Investigation Bureau (AIB) and Federal Airport Authority of Nigeria (FAAN).All those involved in air mishaps in the period under study make up the population of the study.

Themultiple regression model was used and is specified in implicit form as:

AAF=f (PTE, ACW, AAE, WTC, ACL) (1)

It is further stated in explicit form as:

$AAF_t= \alpha_0+\alpha_1 PTE_t+\alpha_2 ACW_t+\alpha_3 AAE_t+\alpha_4 WTC_t+ \alpha_5 ACL_t+\varepsilon_t$ (2)

Where:

AAF = Aviation accidents fatalities (Air Mishaps)

α_0 = Constant; α_1, α_2, α_3, α_4 and α_5= Coefficients

PTE = pilot error (proxy by pilot competence, where '0' indicates no error and '1' indicates an error)
ACW = aircraft worthiness (proxy by the age of aircraft, measured in years)
AAE = lack of airport ambient environment (proxy by government allocation released to the aviation sector, measured in N'billions)
WTC = weather conditions (proxy by visibility level, measured in metres)
ACL= aircraft improper loading (proxy by air transport freight, measured in tons/km)
ε_t = error term

Our apriori expectation is stated as: α_1>0,α_2>0, α_3>0, α_4>0 and α_5>0.
Where:
α_1>0; increase in pilot error will lead to increase in air accident fatalities.
α_2>0;increase in aircraft unworthiness will lead to increase in air accident fatalities.
α_3>0; increase in non-airport ambient environment will lead to increase in air accident fatalities.
α_4>0; increase in adverse weather conditions will lead to increase in air accident fatalities.
α_5>0**;** increase in aircraft improper loading will lead to increase in air accident fatalities.

Data Presentation, Analyses and Interpretation

The results of the statistics indicated that the observations are normally distributed for regression purpose, adjudged to be stationary and unit roots free,there is a long run relationship among the series and that the variables are moving together in time.The model is well specified and the instrument seems to be appropriate. Interestingly, the overall model is highly significant and shows a high goodness of fit even at the 1 percent level, suggesting that the entire results are fundamental for policy decision

Table 1: The Result of the Error Correction Model (Dependent Variable)
Dependent Variable: AAF

Variable	Coefficient	Std. Error	t- Statistics	Prob.
C	7.781002	13.41628	0.579967	0.5673
D(PTE)	96.25922	18.09736	5.318966	0.0000
D(ACW)	-17.63212	13.94497	-1.264407	0.2182
D(AAE)	0.001518	0.000706	2.150146	0.0347
D(WTC)	-0.000141	0.000882	-0.160027	0.8742
D(ACL)	-2.777281	0.734618	-3.780578	0.0004
ECM(-1)	-1.191389	0.201208	-5.921192	0.0000
R^2 = 0.7059	**Adjusted R** = 0.6202	**F- Stat (Prob.)** = 8.2306	**DW** = 2.04	

Source: Author's Computation (2016) Using E-Views 8.0

DAAF=7.7810+96.259DPTE-17.632DACW-0.002DAAE-0.0001DWTC-2.777DACL-1.19ECM (-1)

(**0.5800) (5.3190) (-1.2644) (2.1501) (-0.1600) (-3.7806)**

Hypotheses formulated earlier are restated and tested in this section. The results derived from the estimated equation reported in Table 1 present essential tools for testing various hypotheses of this study. The decision rule was to reject null hypotheses if calculated t-statistics probability value is less than critical probability value at 5%.

Hypothesis I (H_{01})*: Pilot error has no significant impact on air mishaps in Nigeria.*

The result of pilot error (PTE) indicated a t-statistic value of 5.3190 and probability value of 0.000 (0%) which is less than the 5% critical value showing that pilot error is statistically significant. The null hypothesis is rejected; invariably implying that pilot error has significant influence on air mishaps in Nigeria.

Hypothesis II (H_{02}): *Aircraft unworthiness has no significant effect on air mishaps in Nigeria.*

Aircraft unworthiness proxied with the age of aircraft revealed t-statistic of -1.2644 and probability value of 0.2182 (22%) which is greater than the 5% critical value. This means that aircraft unworthiness is not statistically significant. We hereby accept the null hypothesis meaning that the age of an aircraft has no significant effect on air transport accident fatalities in Nigeria.

Hypothesis III (H_{03}): *lack of airport ambient conditionhas no significant relationship with air mishaps in Nigeria.*

Airport ambient environment proxied by government budget stood at calculated t-statistic value of 2.1501 and probability value of 0.0347 (3%) compared to critical value of probability value of 5% significance level. The result indicated that airport ambient environment is statistically significant. Following our decision rule, we therefore reject the hypothesis signifying that airport ambient environment does have a significant effect on air transport accident fatalities in Nigeria.

Hypothesis IV (H_{04}): *Weather condition has no significant relationship with air mishaps in Nigeria.*

The result of weather condition revealed t-statistic value of -0.1600 and probability value of 0.8742 (87%). Based on the decision rule, we therefore accept the hypothesis formulated suggesting that weather condition proxied with visibility level has no significant relationship with air transport accident fatalities.

Hypothesis V (H_{05}): *Aircraft improper loading has no significant effect on air mishaps in Nigeria.*

The result of aircraft improper loading proxied by air transport freight (measured in million ton weight of cargo and passengers carried by aircraft on distance covered) indicated t-statistics calculated value of -3.7806 and probability value of 0.0004 (0%), while critical probability value was at 5% significance level. The outcome suggested that it is statistically significant. Based on the decision rule, we therefore reject the hypothesis formulated, implying that air transport freight has significant effect on air transport fatalities in Nigeria.

Summary, Conclusion, and Recommendations

1. Pilots need to be trained and retrained at regular intervals to acquire experience and to maintain their competence in making good judgments and in responding to a variety of visual/vestibular illusions. Thus, issues like stress and work overload resulting to fatigue for pilots should be avoided. It is the duty of regulatory bodies to properly supervise airline operations to ensure all of these.
2. Aircraft unworthiness based on the age of an aircraft alone is not a major factor of air mishaps. However, combined with other factors such as ill maintenance and overloading of an aircraft, its effect on air mishaps can become significant. Hence, the age of an

aircraft should not be totally ignored in curbing air mishaps in Nigeria. Regulatory authorities should pay more attention to older aircrafts being used in the country.

3. The ambience of an airport such as adequate airfield and runway lightings, modern navigational facilities, and good landing aids can improve flight safety and the efficiency of the air transport sector in Nigeria. Thus, the Nigerian government should adequately budget for the aviation sector and make it a top priority in sustaining economic stability. The regulatory agencies of the Nigerian aviation should ensure that Nigerian airports meet with world renowned ones by keeping abreast with advancing technology and what is obtainable in modern airports.
4. When there is an adequate and regular instrumental proficiency checks on pilots by safety regulatory authorities as well as up to date facilities and a comprehensive manual on how to operate flights in a bad weather, the effects of adverse weather condition will be mitigated. This explains why pilot error effect and airport ambient condition were so significant in the study, although adverse weather condition (proxied by visibility level) on its own was not significant.
5. The proper loading of an aircraft is a key safety issue in air transport management in Nigeria. Failure on the part of regulatory bodies to carry out their functions properly in this regard by adequately monitoring airlines operational control responsibilities in order to correct any deficiency can lead to a flight failure as inferred from the results of the analyses.

The study recommends as follows;

1. Government should grant the aviation regulatory authorities (NCAA, FAAN, AIB, and NIMET) full autonomy in order for them to be empowered to enforce strict compliance with set standards.
2. Government should adequately budget for the aviation sector of the Nigerian economy and ensure that the budgeted amount is actually disbursed and used to care for the needs of the sector including that of the regulatory authorities, airlines, airports, aircrafts, service providers and all such persons, things and issues relating to aviation in Nigeria.
3. The NCAA should provide means by which organizational safety management identifies stress and crisis that pilots may experience from time to time. It is the duty of the regulatory bodies to check from time to time if the pilots are overloaded or exceed stipulated flight hours.NCAA should be sure that airlines provide a comprehensive and well structured operational manual for their pilots, and strictly enforce compliance with such a manual so that pilots can know exactly what to do in any eventuality.
4. It is the duty of the Federal Airport Authority of Nigeria (FAAN) to see to the ambient conditions of airports in Nigeria by ensuring that money disbursed for the ambience of the operational environment of the sector is actually used to maintain the environment, and purchase modern equipments/ facilities that can aid flight safety in terms of take-offs and landing. It is the duty of NIMET to ensure functional and reliable communication facilities to mitigate pilot error in adverse weather condition.
5. It is the role of safety management/oversight to regularly monitor the planning and control responsibilities of airlines operations for cargo loading in order to correct any deficiency arising thereof.

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APPENDICES

APPENDIX I: DATA FOR ANALYSIS

YEAR	AAF	PTE	ACW	WTC	AAE	ACL
1980	0	0	8	105291.4	2,407.80	9.3
1981	0	0	9	95020.81	1,684.80	15.7
1982	0	0	10	140665.6	1,337.70	25.5
1983	53	1	11	123647.8	1,144.10	33.3
1984	0	0	9	106629.9	304.2	30.5
1985	130	1	9	106183.7	366.7	28.7
1986	0	0	8	105737.5	641.9	32.4
1987	0	0	9	105291.4	489.3	37.2
1988	103	1	10	128577	846.5	29.5
1989	0	0	10	128577	854.2	17
1990	0	1	11	128577	1,109.80	23.5
1991	273	1	10	128577	598.8	27.5
1992	200	1	10	128577	981.6	10.3
1993	0	0	11	128577	1,786.80	9.8
1994	0	1	12	128577	1,674.90	7.2
1995	135	1	12	114949.5	4,690.30	1.9
1996	161	1	11	101322.1	11,003.30	4.7
1997	5	1	12	103976	8,437.90	5
1998	0	1	13	106629.9	8,196.90	27
1999	0	0	15	105742.8	9,191.30	9.7
2000	17	1	16	154895.8856	5,336.60	8.824
2001	0	0	17	156995.5556	53,176.10	2.792
2002	158	1	18	153115.0563	53,662.60	8.724
2003	0	0	19	140665.6103	29,309.40	9.996
2004	4	1	20	128576.9831	14,343	9.809
2005	220	1	21	114708.8249	27,763.30	10.029
2006	120	1	19	106629.9078	16,000	11.269
2007	0	1	18	101322.0968	45,610.04	10.036
2008	4	1	18	95020.80707	183,157.90	10.036
2009	0	0	19	103081.6411	20,400	7.966
2010	0	0	20	103182.8535	105,952.10	0
2011	0	0	21	99094.03226	49,230	0
2012	183	1	22	101171.5029	48,902.50	0
2013	13	0		105208.581	54,895.20	0
2014	**0**	0		105291.3697	**32,308.70**	0

APPENDIX II: RESULTSOF ANALYSIS
Descriptive Statistics

	AAF	PTE	ACW	AAE	WTC	ACL
Mean	53.51515	0.575758	13.87879	21533.10	117563.3	14.39942
Median	0.000000	1.000000	12.00000	5336.600	106629.9	10.02900
Maximum	273.0000	1.000000	22.00000	183157.9	156995.6	37.20000
Minimum	0.000000	0.000000	8.000000	304.2000	95020.81	0.000000
Std. Dev.	82.17440	0.501890	4.580922	37499.52	17788.78	11.01591
Skewness	1.208071	-0.306570	0.360573	2.888113	0.736910	0.600432
Kurtosis	3.077172	1.093985	1.569481	12.05371	2.496031	2.055229
Jarque-Bera	8.035081	5.512146	3.528851	158.5849	3.335926	3.210165
Probability	0.017997	0.063541	0.171285	0.000000	0.188631	0.200873
Sum	1766.000	19.00000	458.0000	710592.3	3879588.	475.1810
Sum Sq. Dev.	216084.2	8.060606	671.5152	4.50E+10	1.01E+10	3883.211
Observations	33	33	33	33	33	33

Short Run Model

Dependent Variable: D(AAF)
Method: Least Squares
Date: 06/21/16 Time: 15:55
Sample (adjusted): 1981 2012
Included observations: 32 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	7.781002	13.41628	0.579967	0.5673
D(PTE)	96.25922	18.09736	5.318966	0.0000
D(ACW)	-17.63212	13.94497	-1.264407	0.2182
D(AAE)	0.001518	0.000706	2.150146	0.0347
D(WTC)	-0.000141	0.000882	-0.160027	0.8742
D(ACL)	-2.777281	0.734618	-3.780578	0.0004
ECM(-1)	-1.191389	0.201208	-5.921192	0.0000

R-squared	0.705935	Mean dependent var	5.718750
Adjusted R-squared	0.620165	S.D. dependent var	110.3964
S.E. of regression	6.803811	Akaike info criterion	11.49033
Sum squared resid	111100.4	Schwarz criterion	11.85676
Log likelihood	-175.8453	Hannan-Quinn criter.	11.61179
F-statistic	8.230641	Durbin-Watson stat	2.043941
Prob(F-statistic)	0.000040		